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JUL 16 1964

CURRENT SERIAL RECORDS

WATER SUPPLY OUTLOOK and FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS for WASHINGTON

UNITED STATES DEPARTMENT of AGRICULTURE--SOIL CONSERVATION SERVICE,
and
DEPARTMENT of CONSERVATION STATE of WASHINGTON

Data included in this report were obtained by the agencies named above in cooperation with the U.S. Forest Service, U.S. Geological Survey, National Park Service, and other Federal, State and private organizations.

AS OF
FEB. 1, 1964

UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

To Recipients of Water Supply Outlook Reports:

The climate of the cultivated and populated areas of the West is characterized by relatively dry summer months. Such precipitation as occurs falls mostly in the winter and early spring months when it is of little immediate benefit to growing crops. Most of this precipitation falls as mountain snow which stays on the ground for months, melting later to sustain streamflow during the period of greatest demand during late spring and summer. Thus, nature provides in mountain snow an imposing water storage facility.

The amount of water stored in mountain snow varies from place to place as well as from year to year and accordingly, so does the runoff of the streams. The best seasonal management of variable western water supplies results from advance estimates of the streamflow.

A snow survey consists of a series of about ten samples taken with specially designed snow sampling equipment along a permanently marked line, up to 1000 feet in length, called a snow course. The use of snow sampling equipment provides snow depth and water equivalent values for each sampling point. The average of these values is reported as the snow survey measurement for a snow course.

Snow surveys are made monthly or semi-monthly beginning in January or February and continue through the snow season until April, May or June. Currently more than 1400 western snow courses are measured each year. These measurements furnish the key data for water supply forecasts.

Streamflow forecasts are obtained by a comparison of total or maximum snow accumulation, as measured by snow water equivalent, to the subsequent spring and summer or snowmelt season runoff over a period of years. The snow water equivalent measured in selected snow courses provides most of the index to the streamflow forecast for the following season. More accurate forecasts are usually obtained when other factors such as soil moisture, base flow and spring precipitation are considered and included in the forecast procedure. Early season forecasts assume average climatic conditions through the snowmelt season.

Listed below are the Federal-State-Private Cooperative Snow Survey and Water Supply Forecast reports available for the West which contain detailed information on snow survey measurements, streamflow forecasts, reservoir storage, soil moisture and other guide data to water management and conservation decisions. Soil Conservation Service Reports may be secured from Water Supply Forecasting Unit, Soil Conservation Service, P.O. Box 2807, Portland, Oregon 97208.

PUBLISHED BY SOIL CONSERVATION SERVICE

<u>REPORTS</u>	<u>ISSUED</u>	<u>LOCATION</u>	<u>COOPERATING WITH</u>
RIVER BASINS			
WESTERN UNITED STATES			
WESTERN UNITED STATES	MONTHLY (FEB.-MAY)	PORTLAND, OREGON	ALL COOPERATORS
BASIC DATA SUMMARY			
BASIC DATA SUMMARY	OCTOBER 1	PORTLAND, OREGON	ALL COOPERATORS
STATES			
ALASKA	MONTHLY (MAR.-MAY)	PALMER, ALASKA	ALASKA S.C.D.
ARIZONA	SEMI-MONTHLY (JAN.15 - APR.1)	PHOENIX, ARIZONA	SALT R. VALLEY WATER USERS ASSOC. ARIZ. AGR. EXP. STATION
COLORADO AND NEW MEXICO	MONTHLY (FEB.-MAY)	FORT COLLINS, COLORADO	COLO. STATE UNIVERSITY COLO. STATE ENGINEER N. MEX. STATE ENGINEER
IDAHO	MONTHLY (JAN.-JUNE)	BOISE, IDAHO	IDAHO STATE RECLAMATION ENGINEER
MONTANA	MONTHLY (JAN.-JUNE)	BOZEMAN, MONTANA	MONT. AGR. EXP. STATION
NEVADA	MONTHLY (JAN.-MAY)	RENO, NEVADA	NEVADA DEPT. OF CONSERVATION AND NATURAL RESOURCES - DIVISION OF WATER RESOURCES
OREGON	MONTHLY (JAN.-JUNE)	PORTLAND, OREGON	OREG. STATE UNIVERSITY OREGON STATE ENGINEER
UTAH	MONTHLY (JAN.-JUNE)	SALT LAKE CITY, UTAH	UTAH STATE ENGINEER
WASHINGTON	MONTHLY (FEB.-JUNE)	SPOKANE, WASHINGTON	WN. STATE DEPT. OF CONSERVATION
WYOMING	MONTHLY (FEB.-JUNE)	CASPER, WYOMING	WYOMING STATE ENGINEER

PUBLISHED BY OTHER AGENCIES

<u>REPORTS</u>	<u>ISSUED</u>	<u>AGENCY</u>
BRITISH COLUMBIA	MONTHLY (FEB.-JUNE)	WATER RESOURCES SERVICE, DEPT. OF LANDS, FOREST AND WATER RESOURCES, PARLIAMENT BLDG., VICTORIA, B.C., CANADA
CALIFORNIA	MONTHLY (FEB.-MAY)	CALIF. DEPT. OF WATER RESOURCES, P.O. BOX 388, SACRAMENTO, CALIF.

FEDERAL-STATE-COOPERATIVE
SNOW SURVEY AND WATER SUPPLY FORECASTS
For
WASHINGTON

Report Prepared
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U. S. Department of Agriculture

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Division of Water Resources
Department of Conservation
State of Washington

INDEX to WASHINGTON SNOW COURSES and SOIL MOISTURE STATIONS

NAME	NUMBER SEC. TWP. RANGE ELEV.			NAME	NUMBER SEC. TWP. RANGE ELEV.			NAME	NUMBER SEC. TWP. RANGE ELEV.			
	UPPER COLUMBIA DRAINAGE				Wenatchee River				Lewis River			
Pend Oreille River	Berne-Mill Creek	21B23	7	26N 15E	2925	Blue Lake	21C22a	19	9N 8E	4800	Oinalie Meadows	
Boyer Mountain	Blawett Pass No. 2	20B2	35	22N 17E	4270	Bob's Trail	21C21	25	8N 7E	2200	South Fork Tolt	
Bunchgrass Meadow	Chikwakum G. S.	20B16	4	25N 17E	1810	Calanisy Ridge	21D1a	8	5N 5E	2500	Council Pass	
Mt. Spokane	Lake Wenatchee	20B15	33	27N 17E	1970	Coulee Meadow	21C18a	24	9N 9E	4200	Divide Meadow	
Winchester Creek	Leavenworth R. S.	20B17	1	24N 17E	1127	Grand Meadow	21C29a	21	9N 10E	5600	Lake Elizabeth	
Kettle River	Stevens Pass	20B18	4	26N 16E	2140	Lone Pine Shelter	21C25	28	9N 9E	3500	Skagit River	
Boulder Road	21B1	14	26N 13E	4070	Marble Mountain	21C26	8	7N 7E	3800	Beaver Creek Trail		
Butte Creek	21B2	35	26N 13E	4070	Muddy River	21C25a	26	8N 5E	3200	Beaver Pass		
Cabin Creek	21B3	35	26N 13E	4070	Oldman Pass	21C23	26	8N 6E	1400	Devils Park		
Gent Creek	21B4	5	38N 36E	3170	Plains of Abraham	21D19	22	6N 7E	3100	Freezeout Creek Trail		
Snow Caps Creek	21B5	35	38N 35E	3595	Smith Creek Road	21C21a	35	9N 9E	4400	Freezeout Meadows		
Snow Caps Trail	21B6	3	38N 36E	2150	Spencer Meadow	21C24	29	9N 6E	2100	Lake Horzoneen		
Summit C. S.	21B7	20	39N 35E	4600	Surprise Lakes	21C13a	14	7N 7E	2400	Neadus Cabins		
Colville River	21B8	Upper Wheeler	20B7	30	21N 20E	4450	Table Mountain	21C24a	20	9N 9E	4200	Thunder Basin
Baird	17A6	19	36N 42E	3215	Timbered Peak	21D18a	36	6N 6E	3000	Baker River		
Carlson	18A9	24	32N 38E	2885	Crab Creek	21A11	8	36N 8E	3800	Dock Butte		
Chevelah	17A2	11	32N 41E	4925	Creston-Kunz	21A1	19	36N 11E	5300	Easy Pass		
Stranger Mountain	18A3	26	31N 38E	4990	Govey Pass	21C19	33	10N 7E	4100	Jasper Pass		
Togo	18A10	6	29N 38E	3370	Jack Woods	21C32	28	10N 10E	2200	Marten Lake		
Sanpoil River	18A1	19	36N 35E	5350	Krause	21C31	21	13N 10E	2870	Rocky Creek		
Sherman Creek Pass	20A28a	32	40N 18E	4300	Sheffills	21C33	11	14N 11E	5900	Schroeder's Meadow		
Clark	19A5a	2	36N 23E	7000	Wheatridge	21C14	36	10N 10E	4500	S. F. Thunder Creek		
MacKenack	19A9a	20	36N 24E	6750	William Creek	21C30	3	13N 8E	3250	Sulphur Creek		
Mutton Creek No. 1	19A1	30	37N 24E	5700	Yakima River	21A15	18	36N 9E	1600	Three Mile Creek		
Mutton Creek No. 2	19A10	19	37N 24E	6000	21C11	26	12N 14E	3100	Watson Lakes			
Payson	20A28a	32	40N 18E	4300	21B9	35	23N 14E	3200	21A5	25	37N 9E	4500
Rusty Creek	19A3	18	35N 24E	4000	Big Boulder Creek	21C8	23	16N 12E	3450	Nooksack River		
Salmont Meadow	19A10a	15	35N 23E	6750	Bumping Lake Pass	20B9	25	20N 20E	5370	Panorama		
Starvation Mtn.	19A6	30	39N 25E	2845	Clockum Pass	20B10	17	19N 20E	4123	Puget Sound Drainage		
Touts Coulee	20A10a	10	38N 20E	6200	Cooke Creek	21C10	34	24N 14E	3711	Nisqually River		
Billy Coat Pass	20A29a	8	39N 20E	6000	Fish Lake	20B11	29	21N 19E	5385	White River		
Dollar Watch	20A5a	7	37N 18E	6500	Grouse Camp	21B10a	15	20N 14E	2920	Ghost Forest		
Harts Pass	19A9a	15	40N 23E	7000	High Green Lake	20B12	34	21N 19E	2930	Longmire Paradise Park		
Horseshoe Basin	19A7	36	34N 23E	4650	Lake Elum	21B10	15	20N 14E	2920	Stem Glade		
Loup Loup	20A17	6	34N 18E	5200	Manasitch	20C1	24	17N 16E	3935	Deer Park		
Chehalon Lake Basin	20A25a	3	31N 16E	5400	Morse Lake	20B13	6	16N 11E	5400	Corral Pass		
Agnes Creek	20A21	1	31N 15E	5400	NaNan	20B14	4	20N 19E	3360	White River Entrance (new)		
Bridge Creek	20A15	20	34N 16E	2100	Trail Creek	21B8	13	21N 11E	3360	White River Entrance		
Bullion Creek	20A18	2	33N 16E	1460	Tunnel Avenue	20B15	22	20N 19E	4500	White River Entrance		
Cloudy Pass	20A22a	12	31N 15E	6500	Walters Flat	21C9	2	13N 11E	4500	White Pass (East Side)		
Cottonwood	20A11	10	34N 14E	2500	White Pass (Leach Lake)	21C28	2	13N 11E	4500	White Pass (Leach Lake)		
Dagger Lake	20A17	6	34N 18E	5200	21C27	1	13N 11E	4500	Green River			
Greenwood Flat	20A25a	3	31N 16E	3540	Airstrip	21B24	18	20N 11E	1800	Black and White Lakes		
Little Meadows	20A24a	8	31N 16E	5275	Charly Creek	21B25	27	21N 8E	1200	Elwha River		
Lyman Lake	20A23a	18	31N 16E	5900	Grass Mountain No. 1	21B26	21	20N 8E	4000	Hurricane		
Park Creek	20A13a	18	34N 16E	2220	Grass Mountain No. 2	21B27	14	20N 8E	2900	Skokomish River		
Ridge	20A12a	7	34N 16E	6500	Homestead	21C1	11	9N 40E	3100	Black and White Lakes		
Pass Creek	20A19	20	33N 16E	2500	Martin Springs (Helmers Mtn.)	17C2M	2	9N 35E	2387	Home Sweet Home		
Petersen	20A16a	3	34N 17E	3730	Walla Walla Diversion	18D13	22	6N 38E	2386	Sundown Pass		
Rainy Pass	20A9	21	35N 17E	4780	21B3	29	15N 8E	5559	Deer Park			
Safety Harbor	20A30	32	31N 20E	6000	21B2	27	15N 8E	2760	Corral Pass			
Seven Mile	20A26	14	31N 17E	3015	21B13	30	18N 11E	6000	White River Entrance			
Two Mile	20A27	16	31N 18E	2020	21C15	23	9N 12E	3400	White River Entrance			
Entiat River	20B19	24	28N 19E	1600	21C12	35	7N 8E	4000	Black and White Lakes			
Brief					21B30	18	19N 11E	4100	Black and White Lakes			
					21B28	12	20N 8E	2100	Black and White Lakes			
					21B29	36	20N 10E	2390	Black and White Lakes			
					21B31	5	19N 11E	4700	Black and White Lakes			
					21B32	25	21N 11E	3000	Black and White Lakes			
					21B33	5	19N 11E	4700	Black and White Lakes			
					21B34	25	21N 11E	3000	Black and White Lakes			
					21B35	28	25N 5W	5200	Black and White Lakes			
					21B36	25	24N 7W	3900	Black and White Lakes			

LEGEND
NUMBERING SYSTEM EXAMPLE
21A7 SNOW COURSE ONLY
21A7a AERIAL MARKER ONLY
21A7a SNOW COURSE AND AERIAL MARKER
21A7m SNOW COURSE AND SOIL MOISTURE STATION
21A7m SOIL MOISTURE STATION

WATER SUPPLY OUTLOOK

State of Washington
February 1, 1964

*
* The water supply outlook for irrigation and power in the Columbia *
* Basin in Washington and its tributary streams is good for this time *
* of year. Snow surveys made in the State and neighboring areas near *
* the first of February show a snowpack that varies from a low of 69% *
* of normal to a high of 143% of normal. Watershed soil mantles are *
* generally wetted up to near average conditions through good fall *
* precipitation. Reservoir storage is generally less than normal for *
* this time of year but the reservoirs should fill during the spring *
* runoff.
* *

Note

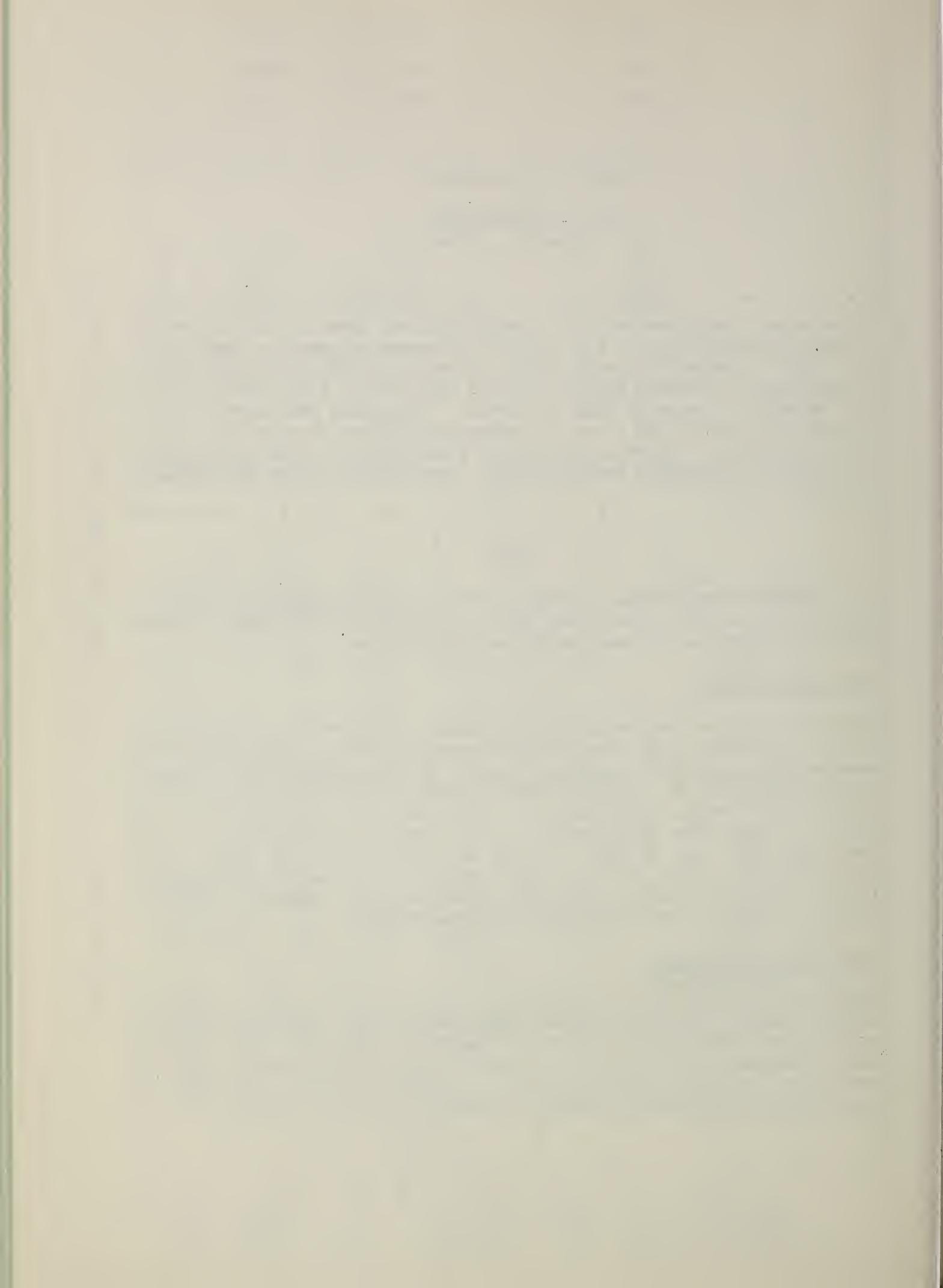
All snow cover percentage figures quoted will be "projected". The normal increase of snow water that can be expected from the date of measurement to April 1 is added to the measured figure.

PEND OREILLE RIVER

Eight snow courses are measured the first of February on the portion of this drainage that lies in Washington and Idaho. Only four of the courses have sufficient length of record to be compared with average. These courses are 9% greater than normal for this time of year. Projecting the February 1 snowpack on the basis of a normal increase to April 1, these same four courses are 123% greater than what was measured last year and 3% greater than what was measured in 1962. Fall precipitation in this area was below normal as was December precipitation. The above normal rainfall which occurred during the month of January was not sufficient to make up this deficit.

COLVILLE-KETTLE RIVERS

Very little information is available at this time to make a conclusive outlook for the Colville-Kettle-Sanpoil watersheds. Only two courses--and they in Canada--have sufficient length of record for any comparison. Comparing the outlook for this year with experiences of the last two years, the water supply should be considerably better than 1963 and very close to that which occurred in 1962.



The one snow course in the Kettle valley with 24 years of record has a snowpack that is 265% of last year, 95% of 1962 and 10% greater than average. These figures are projected with normal increase to April 1, 1964. Actual measurements on two snow courses in the Kettle River drainage compared to average February 1 conditions show the watershed to be 9% greater.

Fall precipitation in these drainages was slightly better than normal while precipitation which fell during the month of December was less. January precipitation is not available at this time for these watersheds.

The mainstem of the Columbia River as measured at Boundary was 2% less than normal for the month of January. The indications of an April-Sept runoff for the Columbia at Birchbank are for flows nearly 7% greater than average. The Kettle River had a streamflow only 69% of average for January.

SPOKANE RIVER

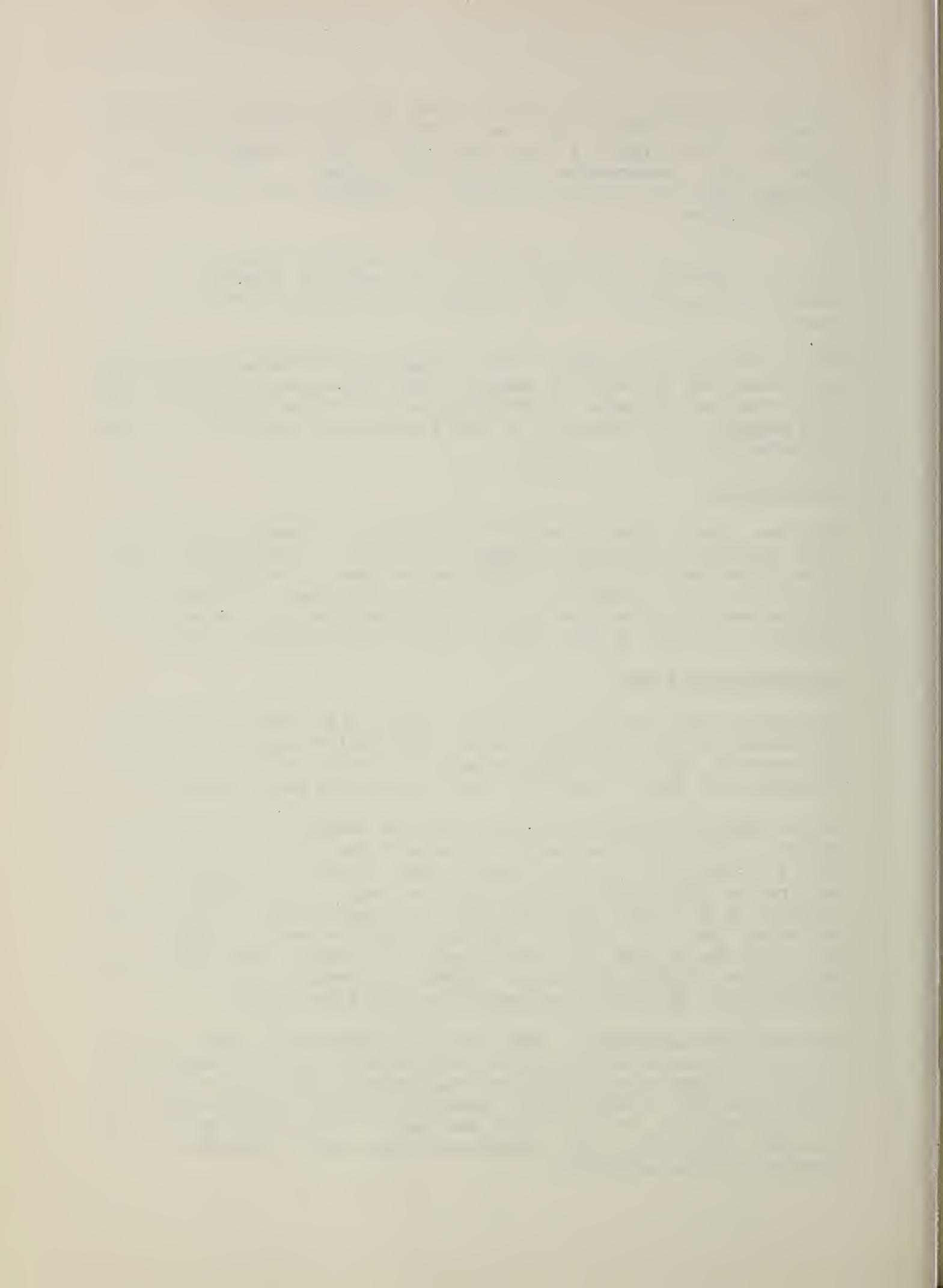
Only one snow course is measured on the Spokane River that has sufficient length of record to be compared to normal. This course, Lookout in northern Idaho, is only a little better than the average but nearly twice as good as was measured last year at this time. Streamflow during the month of January was only 55% of normal but it is expected that seasonal flows will be near normal for the April-September period.

OKANOGAN-METHOW RIVERS

The outlook for irrigation and water supply in the Okanogan and Methow watersheds as of February 1 is for normal water supplies. Comparing the snow data with that which occurred last year and the outlook as presented last year at this time, the situation is much improved.

In the Okanogan watershed there are ten snow courses with 5-27 years of record. When these courses are compared to the projected water equivalents, the snowpack at this time is 206% of last year, 38% above what occurred in 1962 and 105% of the 1943-57 average. As of February 1, the snowpack is 5% better than normal for this time of year. On the Methow watershed the five courses with 8-20 years of record are 85% better than last year at this time projected, 56% better than 1962 and 4% better than the 1943-57 average. Based on February 1 data, the water equivalent is 7% better than average for this time of year.

Soil moisture measurements made at Trout Creek snow course in Canada for the Okanogan watershed are not available as of the writing of this report. A comparison of earlier measurements with that of previous years indicates a soil mantle condition that is a little wetter than has been reported for the past two years. It is hoped by this time next year additional soil moisture stations will be available for reporting of these watersheds.



During the month of January, flows have been considerably greater than normal and the expected runoff during the April-September period is forecast to be about 10% over the normal 1943-57 base flows.

WENATCHEE-CHELAN-ENTIAT RIVERS

On these watersheds the snow cover is generally above normal. The outlook for irrigation and power is for an adequate water supply during the forthcoming runoff season. Very little melting has occurred during the past month and the heavy storms of the latter half of January put considerable snow onto these watersheds.

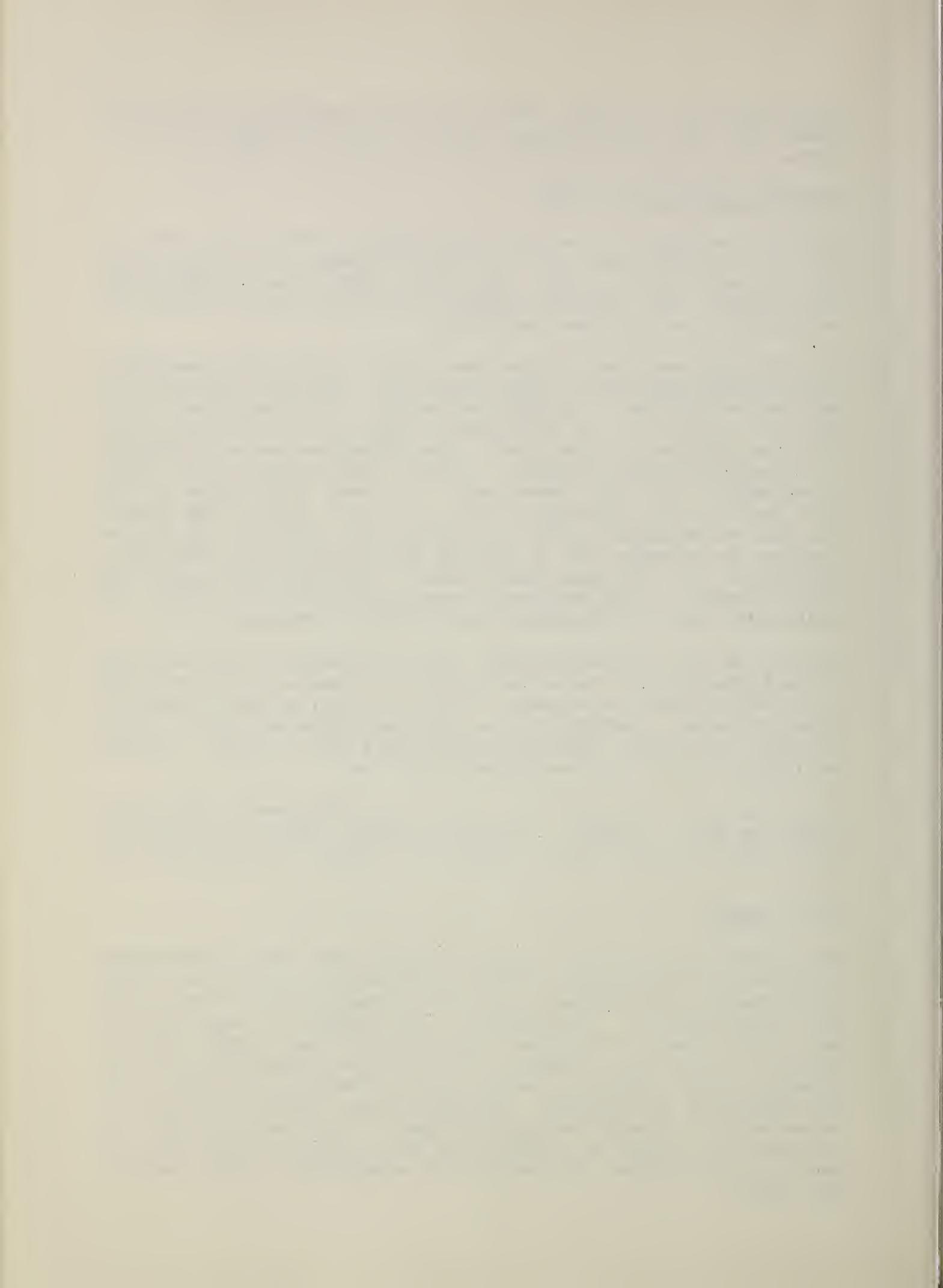
The only measurements made of the snow cover in the Chelan Lake Basin are one ground measurement made at Rainy Pass and seven aerial markers read from an airplane. Applying the density, an estimated water content is applied to the snow depth of the aerial marker and a water equivalent computed. On this basis, the indications are as of February 1, a snowpack only 88% of normal. The one snow course on the Entiat River, Brief, has only three years of record. This course is well above that which was measured last year at this time and 25% greater than what was measured in 1962. On the Wenatchee drainage, the indications are the snowpack is 5% greater than average as of February 1. Measurements for the three snow courses, projected with a normal increase to April 1, 1964, indicate a snowpack that is 227% of 1963, 35% greater than 1962 and 3% greater than the 1943-57 average.

There are no soil moisture stations located directly in this watershed but fall precipitation is an indication of the amount of moisture held in the soil beneath the snowpack. During the fall period of September through November, precipitation was only two-thirds of normal. During the month of December, precipitation was only 50% of normal. January precipitation data is not available at this time.

Runoff from the Chelan-Wenatchee area was 15-20% greater than normal during the month of January. Forecasts indicate that the seasonal flow for the April-September period should be between 5-10% greater than normal.

YAKIMA RIVER

The outlook for irrigation and water supply in the Yakima watershed as of February 1 is very good. While the reservoirs have a below normal active storage, the snowpack in the hills should be sufficient to take care of this deficit. On February 1, the snowpack in this watershed was 125% of normal. Projecting this snowpack through April 1 and comparing it with 1963 and 1962, the eleven snow courses with from 8-42 years of record, indicate a snowpack that is 304% of 1963, 158% of 1962 and 15% greater than average. The heavy snows which fell during the latter part of January accounted for most of this heavy snowpack. In one area this snowpack is so light that the over-snow machine could not get to the snow course. The pack is not consolidated enough to hold up the vehicle.



The one soil moisture station in this watershed indicates a soil mantle that is not as saturated as occurred during the last two years but still quite damp. Very little melting has taken place at the lower elevations during the last half of the month and the snow that fell to the valley floors has remained to a great extent.

Runoff during the month of January in this basin was 8% below normal. Precipitation for the month was 173% of normal as measured at the five reservoirs and for the period since September 1, 1963, 99.5% of normal. End of month storage in the five reservoirs is 42,000 acre feet, which is the lowest that has occurred since 1958. Monthly inflow was 96,660 acre feet. These reservoir and precipitation figures are supplied by the U. S. Bureau of Reclamation's Yakima Office.

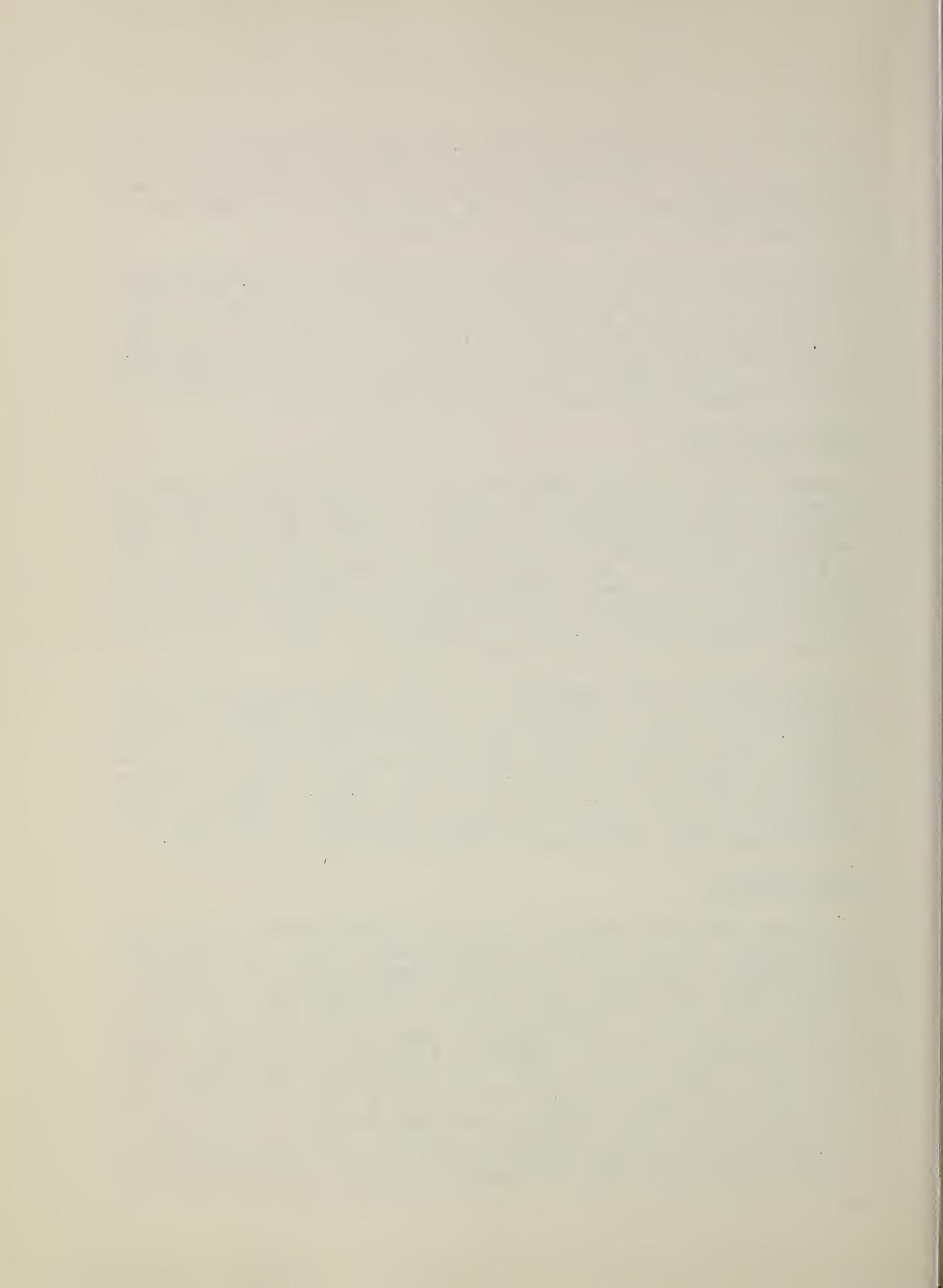
WALLA WALLA RIVER

Streamflow in the Walla Walla watershed during 1964 will be close to average if snow accumulates at a normal rate the rest of the winter season and spring precipitation is normal. Stored water in the upper reaches of this watershed are satisfactory for this time of year. January storms piled snow at a heavy rate, raising the water content of the snowpack from a low of 29% of average to 110% as of February 1. Water content at Tollgate snow course was raised from 8.6 inches on the first of January to 23.2 inches on February 1. This is a new record increase of 14.6 inches for the month of January.

The soil mantle is well recharged for this time of year and now averages 83% of capacity. This will favor a good runoff during the forthcoming season. Runoff during the month of January was only 79% of normal. Forecasts of the South Fork, as made by the Soil Conservation Service in Oregon, are for flows during the April-September period of 76,000 acre feet and the April-July period, 63,000. In comparing these forecasts of flow to normal, it is expected that the April-September flow will be 100% of normal while that of April-July will be 102%.

LOWER COLUMBIA

The outlook for water supply in the lower Columbia portion of the State of Washington is for good to excellent flows during the forthcoming runoff season. Snow cover in the upper reaches of this area indicate a snowpack that is well above that which occurred last year, estimated at greater than 300% and nearly 50% greater than that which was measured in 1962 at this time. The February 1 snow cover, projected through normal increases to April 1, indicates a snowpack for the White Salmon to be 273% of 1963, 128% of 1962, and 14% greater than average. The Lewis River, with three courses with sufficient record, is 262% of 1963, 30% greater than 1962, and 13% greater than average. Indications of precipitation have been received for the Lewis River and these had a January precipitation that averaged 185% of normal. Fall precipitation in this area was near normal and December precipitation well below normal.



PUGET SOUND

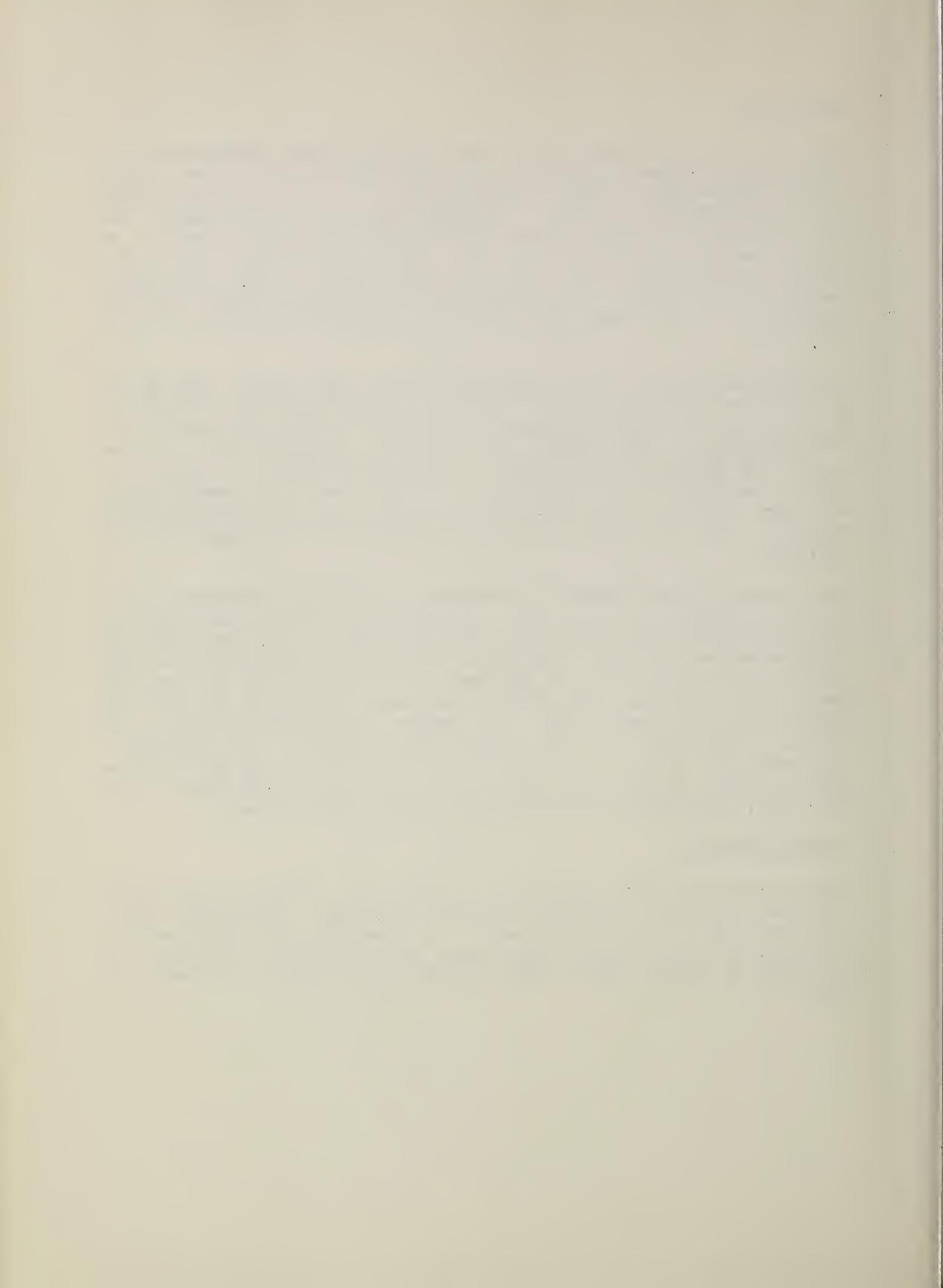
Indications for the seasonal flow from the Puget Sound drainage are for better than what has occurred in both 1963 and 1962 and in some cases better than average. Heavy storms during the latter part of January put down considerable moisture throughout the whole Cascade Range and precipitation that fell at the middle to lower elevations the last of January was absorbed by the snowpack. If freezing levels stay at reasonably low elevations for the rest of the winter, this water should remain in the snowpack. If by chance the freezing levels rise and warm rains fall, further flooding may occur on some of the streams in this area.

The Nisqually River as of February 1 has a snow cover that is 31% greater than average; the White 42% greater; the Green, measured by only one snow course, 1% less than normal; the Snoqualmie, measured by one snow course, 43% greater; the Skykomish, again by only one snow course, 40% greater; and the Skagit, 5% less than normal. A truer picture of the Skagit Basin will have to await the March 1 measurements when more snow courses are measured and will give a better overall coverage. It is believed the 95% of normal for the Skagit is a low estimate.

When projecting the February 1 measurements for these drainages with a normal increase to April 1, 1964, measurements indicate a snowpack for the Nisqually that is 140% greater than 1963, 43% greater than 1962 and 18% greater than average. The White River for the same period is 158% greater, 69% greater, and 26% greater. The Green is 113% greater, 40% greater, and 1% less. The Snoqualmie, again measured by only one course, is 392% greater than that which was measured in 1963, 75% greater than 1962, and 24% greater than average. The Skykomish, measured by one course, is 161% greater than 1963, 46% greater than 1962, and 26% greater than average. The Skagit is 70% greater than last year, 36% greater than 1962 and 2% greater than normal.

OLYMPIC PENINSULA

There is only one snow course with any length of record in the Olympic Peninsula that can be used for comparison purposes. This course has a snowpack that is only 77% of normal. In comparing the other courses with that which was measured last year, the indications are that the snowpack is about 200% of 1963 and 50% greater than was measured in 1962.

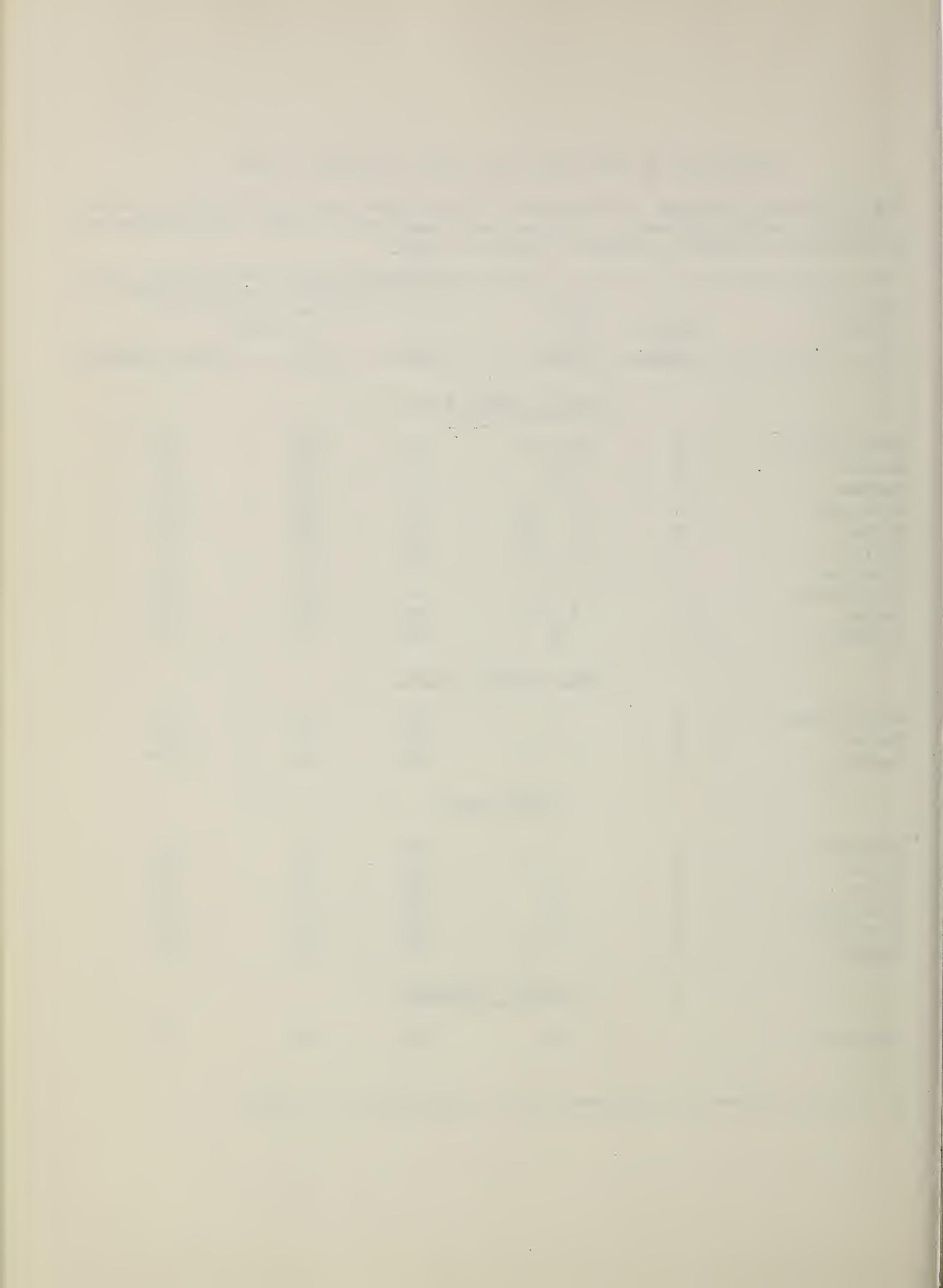


COMPARISON OF SNOW COVER WITH THAT OF PREVIOUS YEARS

The following tabulation of Washington stream basins presents the water content of the snow about February 1, 1964 as per cent of that which can be expected on the basis of normal increase to April 1, 1964.

Tributary Basin	No. of Courses Average	Years of Record	Projected 1964 Snow Water Expressed as per cent of April (Actual)		
			1963	1962	1943-57 Average
<u>UPPER COLUMBIA BASIN</u>					
Pend Oreille	4	25 - 27	223	103	106*
Kettle	1	24	265	95	110
Spokane	1	27	165	93	102*
Okanogan	10	5 - 27	206	138	105*
Methow	5	8 - 20	185	156	104*
Chelan	5	6 - 10	168	134	90*
Wenatchee	3	6 - 19	227	135	103*
Squilchuck	2	9	--	112	108*
Yakima	11	8 - 42	304	158	115*
Ahtanum	1	22	143	64	67*
<u>LOWER COLUMBIA BASIN</u>					
White Salmon	2	6	273	128	114*
Lewis	3	6 - 7	262	130	113*
Cowlitz	5	6 - 12	267	147	115*
<u>PUGET SOUND</u>					
Nisqually	4	7	240	143	118*
White	4	7 - 12	258	169	126*
Green	1	17	213	140	99*
Snoqualmie	1	14	492	175	124*
Skykomish	1	19	261	146	126*
Skagit	6	6 - 13	170	136	102*
<u>OLYMPIC PENINSULA</u>					
Dungeness	1	10	210	143	86*

* Records of less than 15 years used in computation of average.



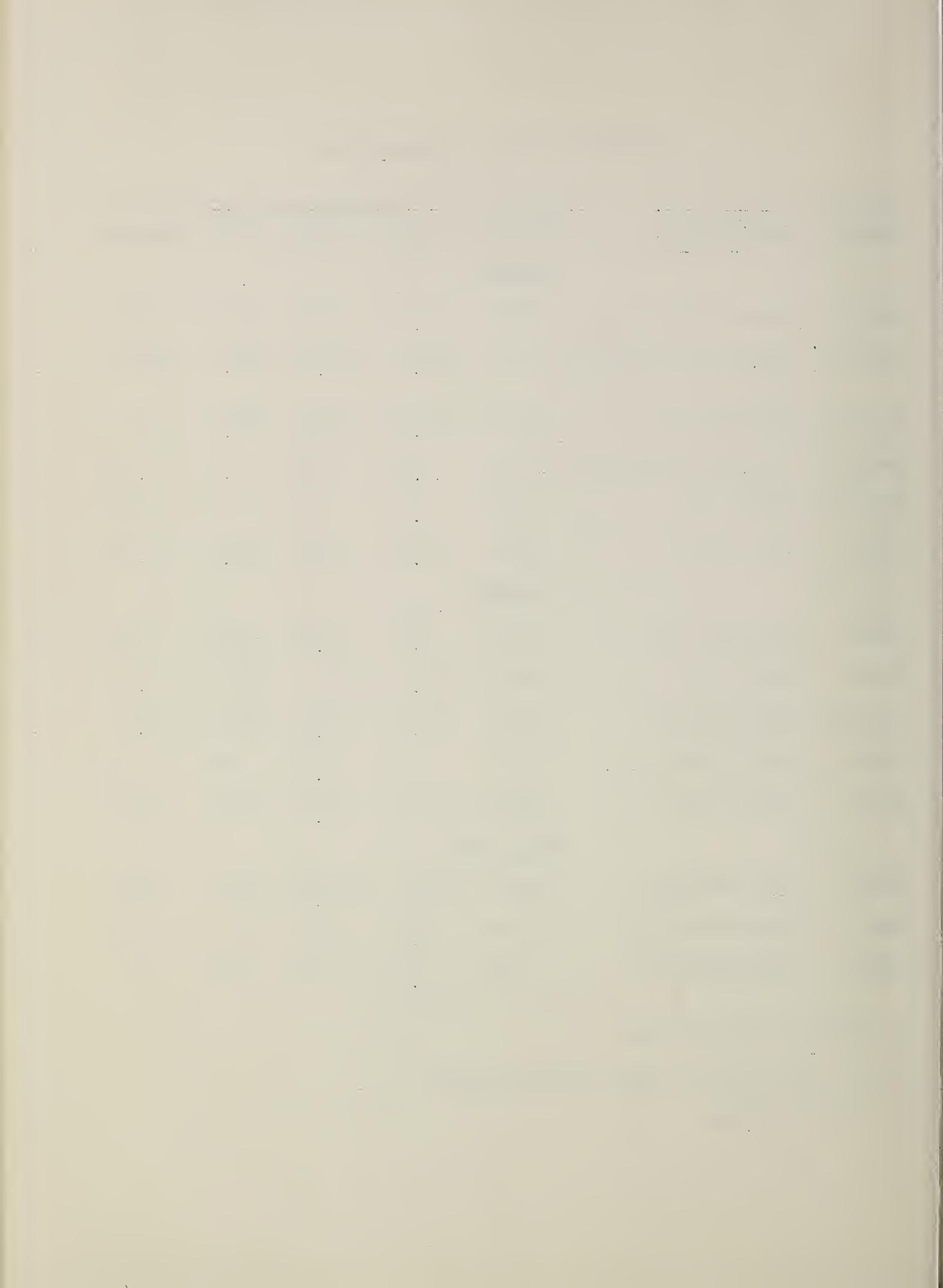
RESERVOIR STORAGE - 1000 Acre Feet

BASIN or STREAM	RESERVOIR <u>1/</u>	USABLE CAPACITY	Measured (February 1)				
			1964	1963	1962	Normal*	
<u>COLUMBIA</u>							
Spokane	Coeur d'Alene Lake	889.0	104.9	92.7	94.0	127.7	
Columbia	Franklin D. Roosevelt Lake	5232.0	4118.0	3345.0	3484.0	4350.1	
Columbia	Banks Lake <u>2/</u>	761.8	354.4	303.9	481.6	--	
Okanogan	Conconully Reservoir	13.0	3.8	4.7	4.4	6.9	
Okanogan	Salmon Lake	10.5	9.5	5.1	7.7	8.9	
Chelan	Lake Chelan	676.1	317.6	370.6	268.0	315.6	
<u>YAKIMA</u>							
Yakima	Keechelus Lake	157.8	56.8	100.0	98.0	84.5	
Kachess	Kachess Lake	239.0	132.7	193.0	183.0	165.3	
Cle Elum	Lake Cle Elum	436.9	140.1	281.0	240.1	250.1	
Bumping	Bumping Lake	33.7	7.4	10.6	7.6	11.3	
Tieton	Rimrock Lake	198.0	84.0	130.9	110.2	116.8	
<u>PUGET SOUND</u>							
Skagit	Ross Reservoir	1202.9	1162.2	1142.8	964.5	484.5	
Skagit	Diablo Reservoir	90.6	83.8	82.4	85.1	85.8	
Skagit	Gorge Reservoir	9.8	7.7	7.8	8.5	--	

1/ Based on Active Storage

2/ Less than 15-year record in period 1943-57

* 15-year average



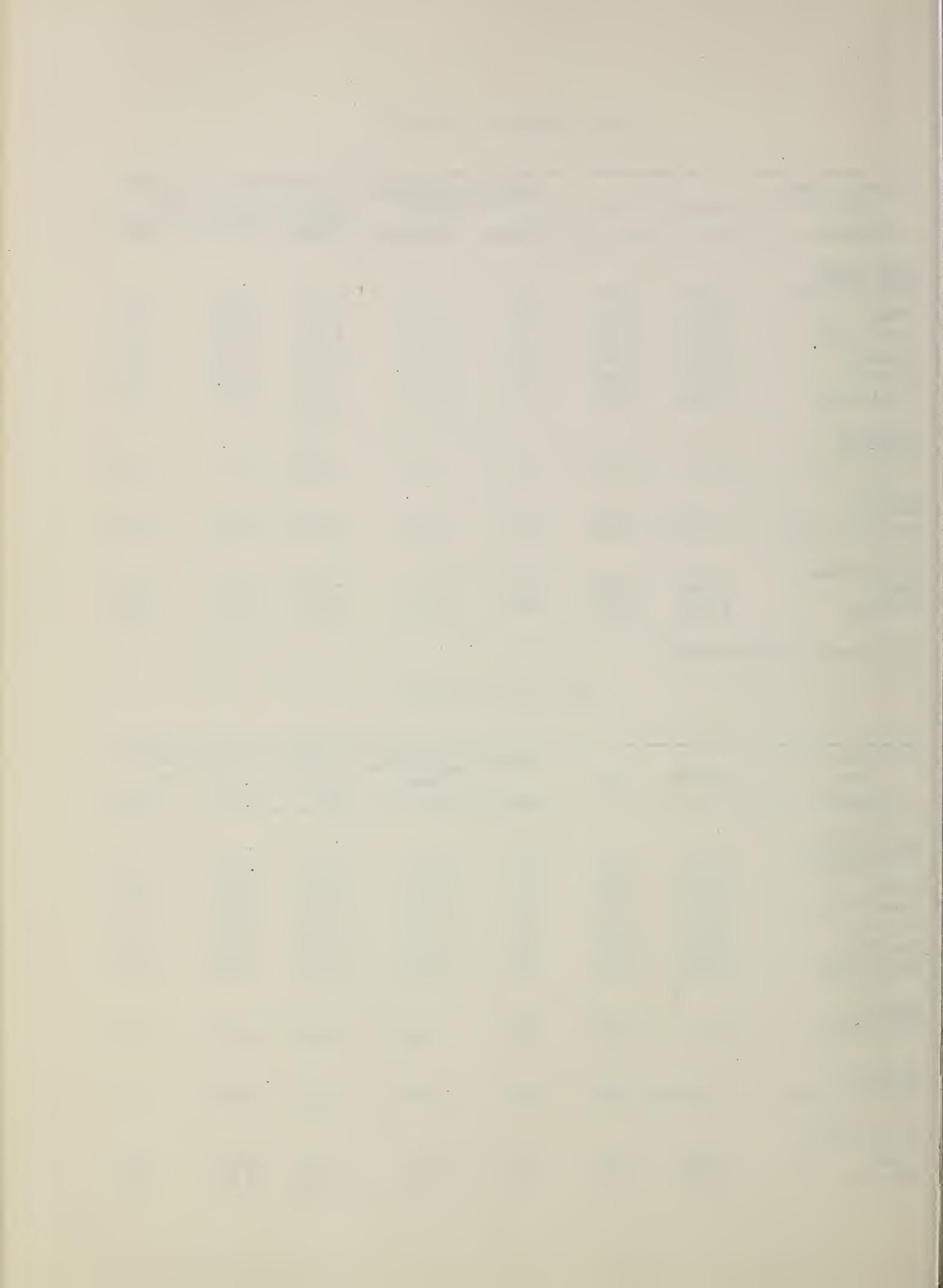
SOIL MOISTURE - FEBRUARY

Drainage Basin and Station	Number	Elev.	Profile (Inches) : Soil Moisture Content			:(Inches) as of Feb. 1		
			Total Depth	Capacity	: 1964	1963	1962	
<u>CRAB CREEK</u>								
Creston-Kunz	18B1m	2440	48	13.6	6.71	6.18	10.49	
Govan	18B2m	2100	48	13.6	7.78	8.09	8.23	
Jack Woods	18B3m	2600	48	13.6	8.35	6.71	8.92	
Krause	18B4m	2440	48	13.6	6.41	7.69	5.71	
Sheffels	18B5m	2360	48	13.6	5.16	6.45	4.53	
Wheatridge	18B6m	2200	48	13.6	5.62	5.85	6.22	
<u>OKANOGAN</u>								
Trout Creek	3-M	3600	48	7.3	3.09*	2.59*	2.97*	
<u>YAKIMA</u>								
Lake Cle Elum	21B14M	2200	48	12.8	9.08	11.58	12.42	
<u>WALLA WALLA</u>								
Couse	17C3m	3650	48	11.1	7.02*	7.31	7.74	
Helmers	17C2M	4400	48	12.0	8.47	8.73	9.76	

* January 1 measurement

FALL SOIL MOISTURE

Drainage Basin and Station	Number	Elev.	Profile (Inches) : Soil Moisture Content			:(Inches) as of Oct. 1		
			Total Depth	Capacity	: 1963	1962	1961	
<u>CRAB CREEK</u>								
Creston-Kunz	18B1m	2440	48	13.6	5.13	9.40	4.25	
Govan	18B2m	2100	48	13.6	5.79	9.95	5.60	
Jack Woods	18B3m	2600	48	13.6	6.75	7.06	7.35	
Krause	18B4m	2440	48	13.6	5.23	9.47	4.99	
Sheffels	18B5m	2360	48	13.6	3.69	6.69	3.67	
Wheatridge	18B6m	2200	48	13.6	4.50	7.49	4.09	
<u>OKANOGAN</u>								
Trout Creek	3-M	3600	48	7.3	3.23	2.80	3.00	
<u>YAKIMA</u>								
Lake Cle Elum	21B14M	2200	48	12.8	6.63	6.80	9.50	
<u>WALLA WALLA</u>								
Couse	17C3m	3650	48	11.1	5.73	7.20	6.60	
Helmers	17C2M	4400	48	12.0	5.75	7.60	6.90	



PRECIPITATION 1/

Division Averages and Departures

DRAINAGE DIVISIONS	FALL		WINTER	
	Sept-Oct-Nov. 1963 Average	2/ Departure	Dec. 1963 & Jan. 1964 Average	2/ Departure
Columbia in Canada	6.79	+ 1.02	5.99	+ 0.04
Pend Oreille - Spokane	8.05	- 0.78	7.88	- 0.32
Northeastern Washington	5.33	+ 0.11	5.31	+ 0.58
Southeastern Washington	5.60	- 0.30	6.05	+ 0.50
Central Washington	9.93	- 3.16	14.91	- 0.05
North Central Washington	3.40	+ 0.21	3.92	+ 0.69
Northwest Slope Cascades	26.46	+ 3.93	26.04	+ 4.12
Southwest Slope Cascades	16.24	- 0.57	21.85	+ 4.26
Blue Mountains, Oregon	5.02	+ 0.23	4.96	- 0.36
Lower Columbia in Oregon	4.76	- 0.58	5.39	- 0.53

Northeastern Washington - Lower Spokane, Colville, Sanpoil and Lower Kettle Drainages.

Southeastern Washington - Touchet, Tucannon and Palouse Drainages.

Central Washington - Yakima, Wenatchee and Chelan Drainages.

North Central Washington - Methow and Okanogan Drainages.

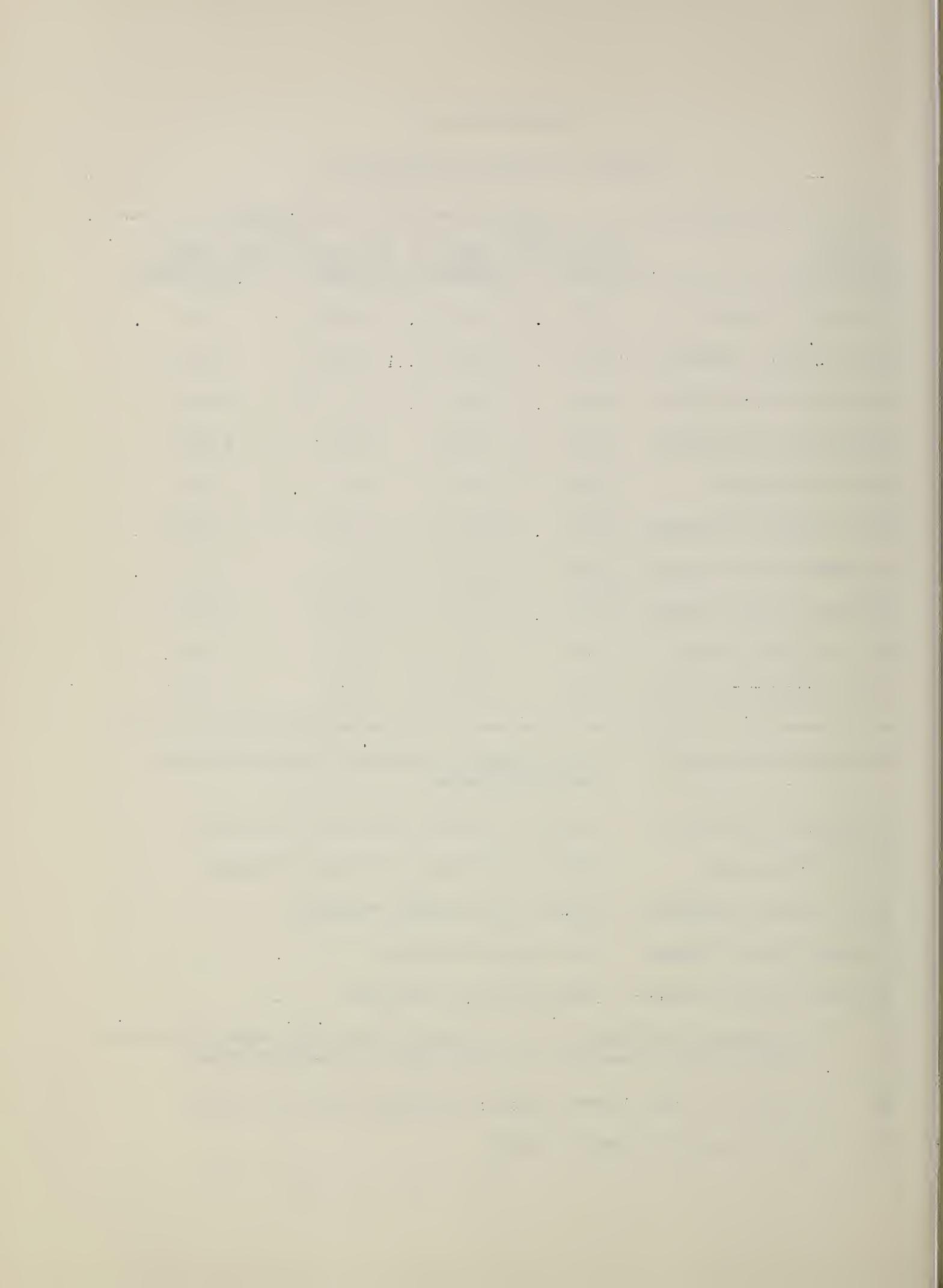
Northwest Slope Cascades - Puget Sound Drainages

Southwest Slope Cascades - Lower Columbia Drainages.

1/ - Preliminary analysis by U. S. Weather Bureau from data furnished by Meteorological Services of Canada and U. S. Weather Bureau.

2/ - Departure from 15-year (1943-57) drainage division average.

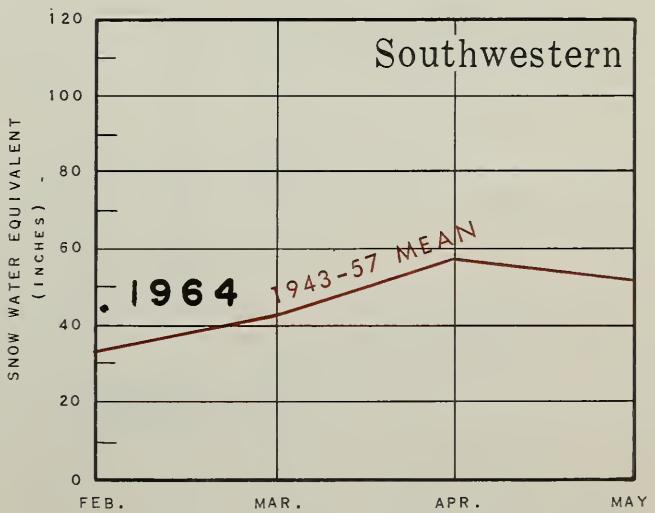
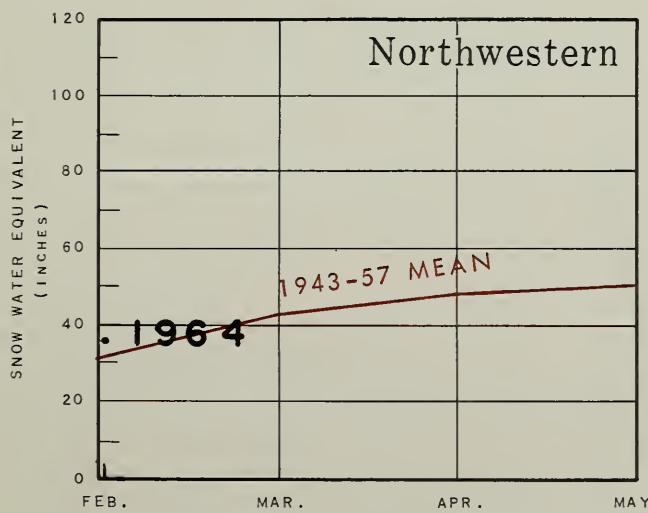
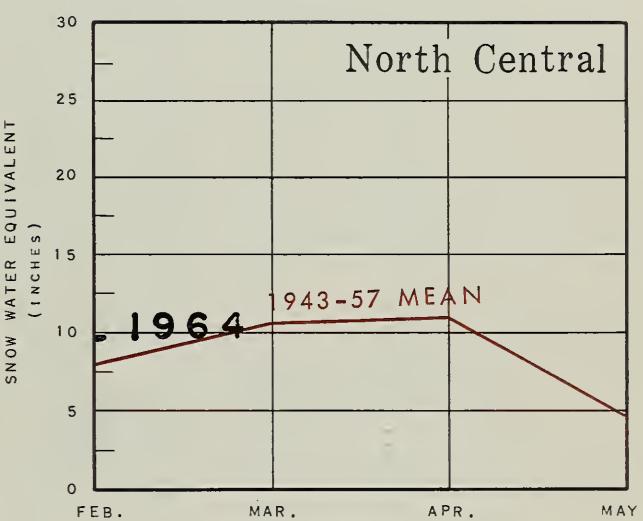
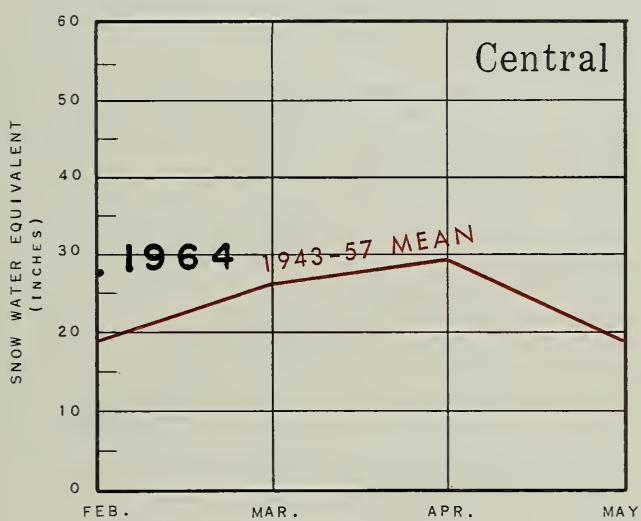
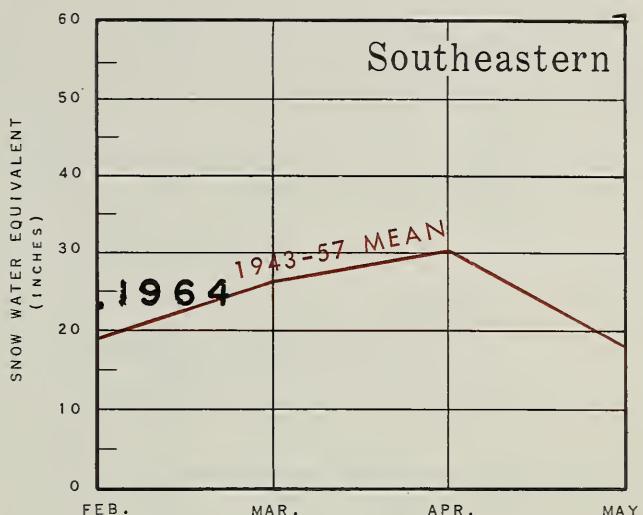
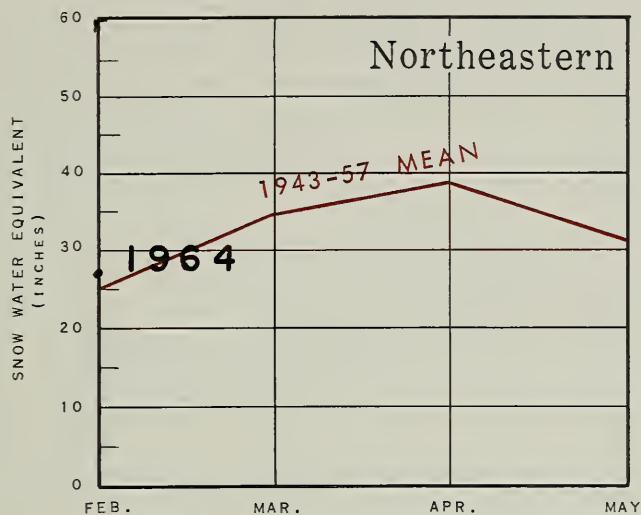
Note - Precipitation shown in inches.

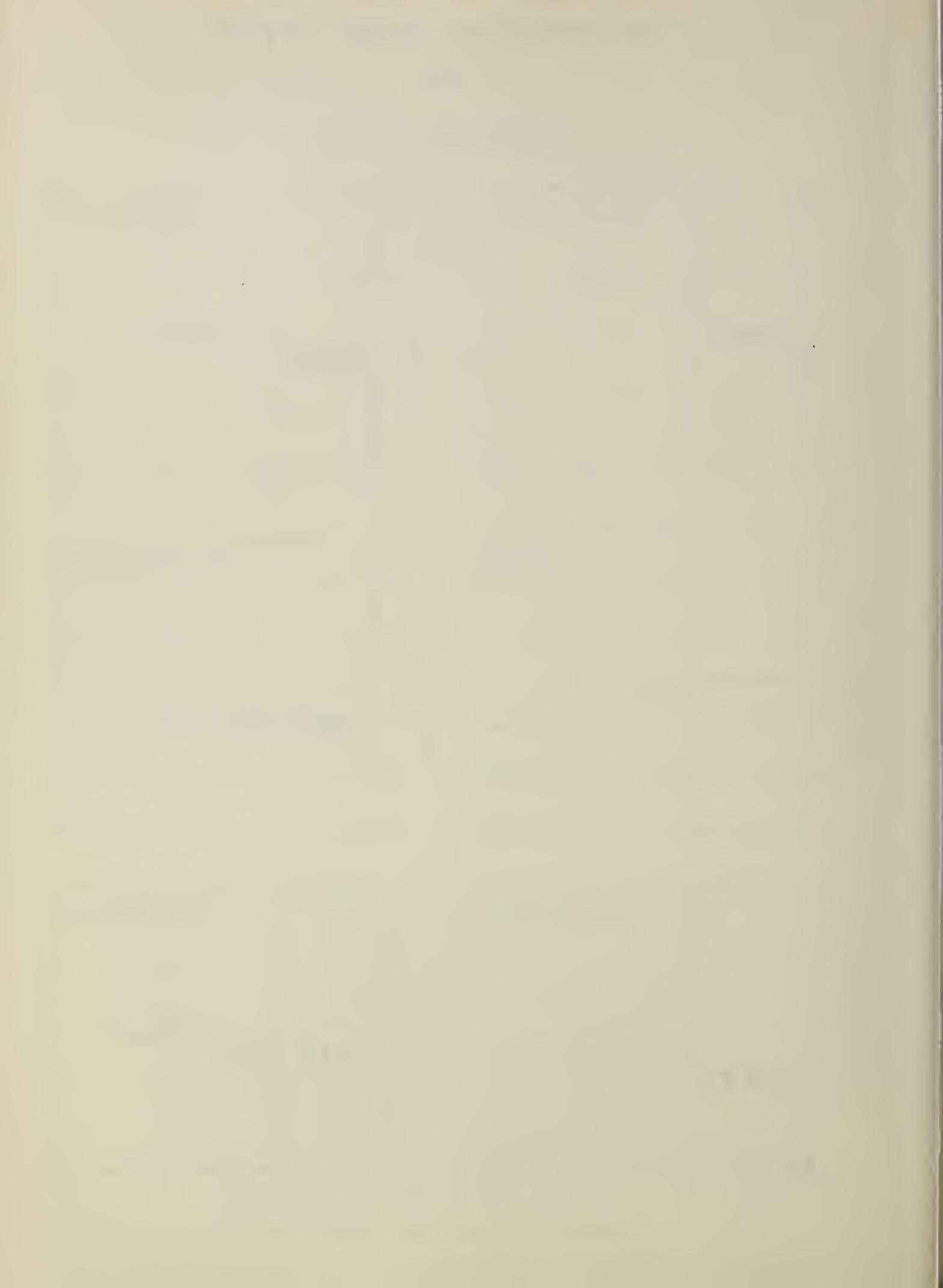


WASHINGTON SNOW COVER

1964

DRAINAGE AREAS

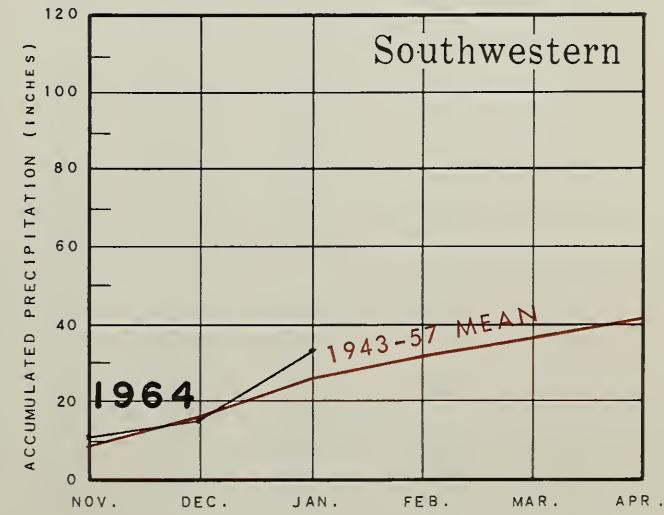
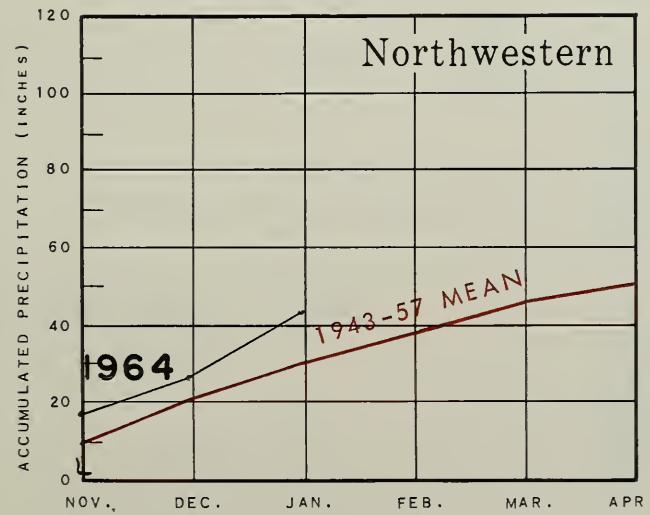
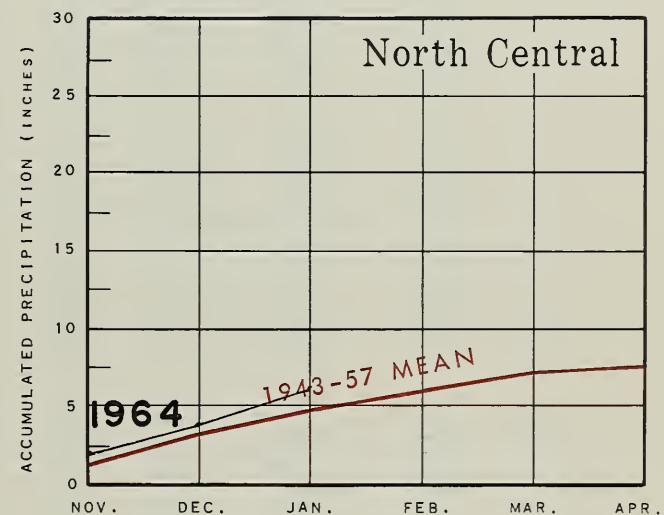
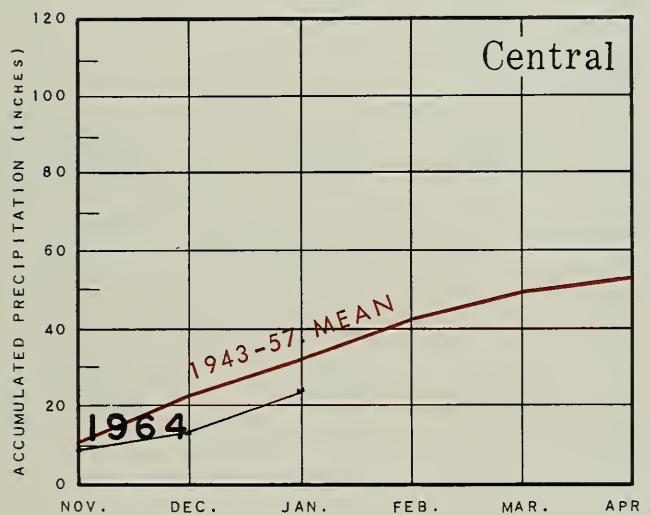
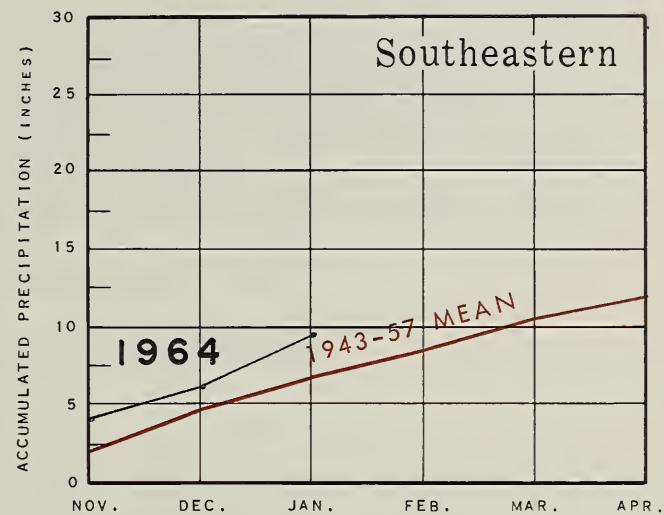
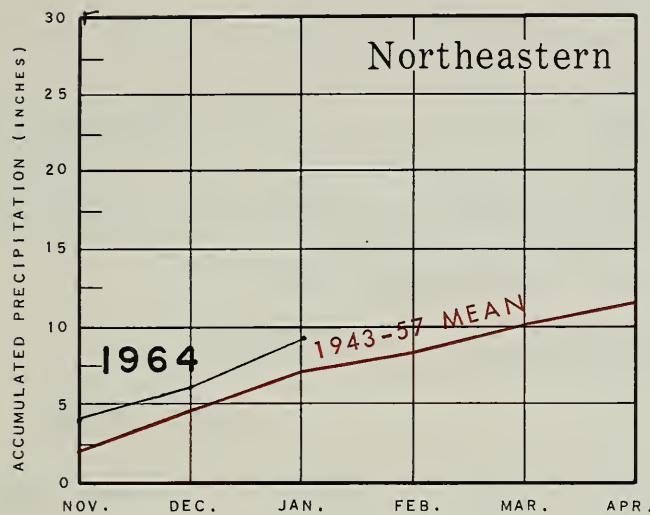


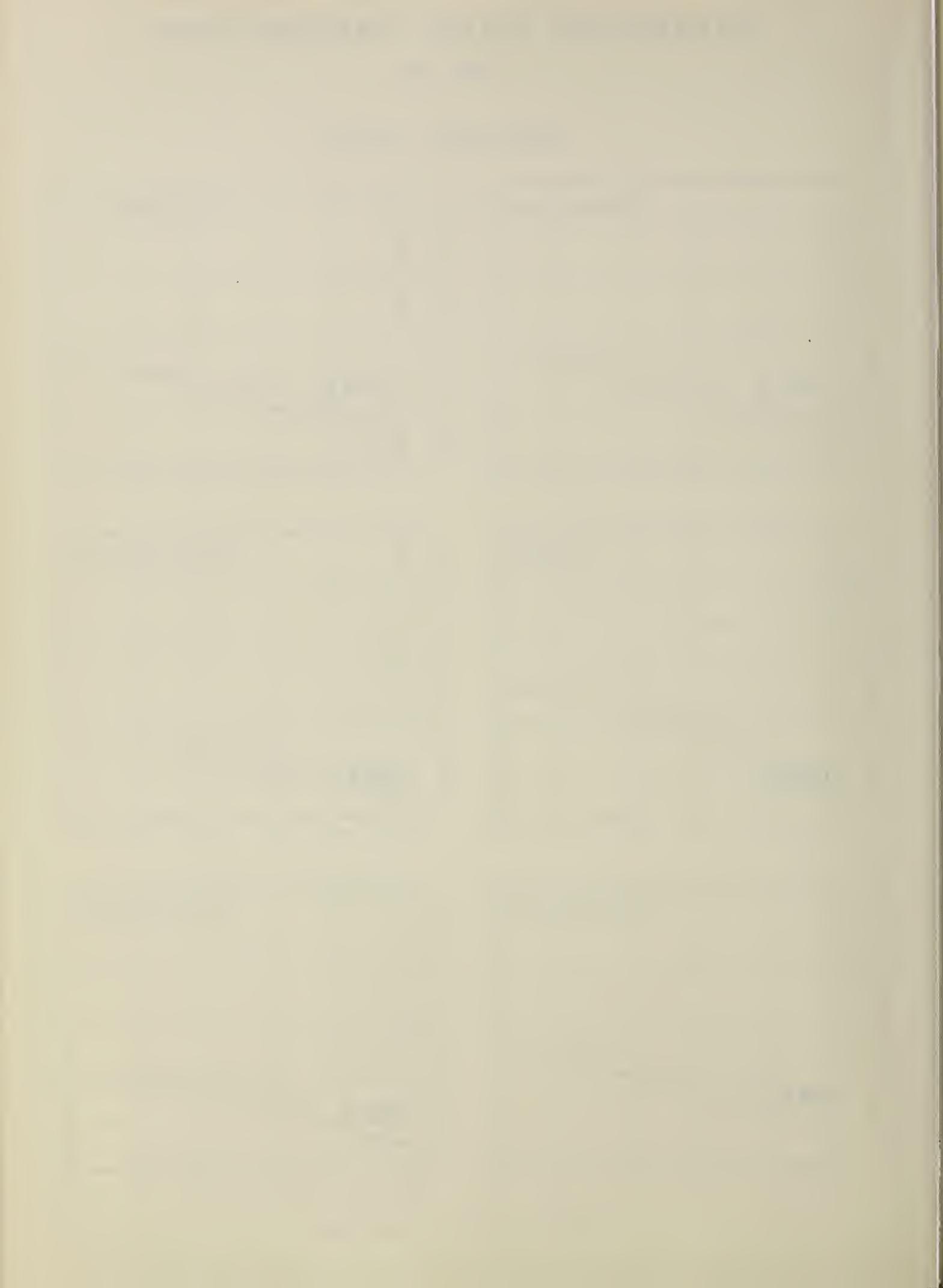


WASHINGTON VALLEY PRECIPITATION

1963 - 1964

DRAINAGE AREAS





APPENDIX 1

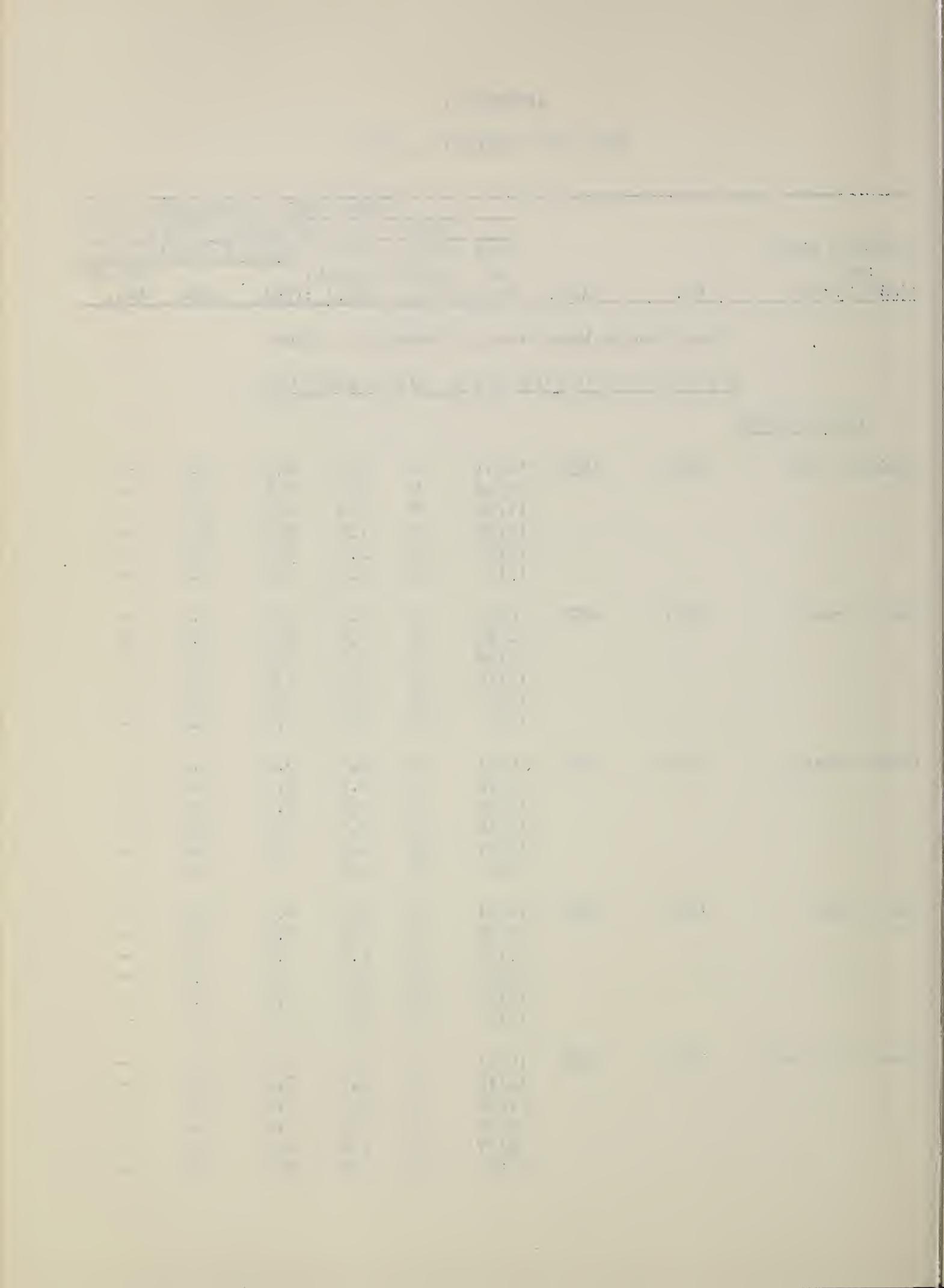
SNOW DATA FEBRUARY 1, 1964

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT				
			1964		: Past Record		
			Date of Survey	Snow Depth (In.)	Water Content (In.)	Water Content: 1963	1962 Avg.

Snow Surveys Made Prior to February 1, 1964

U P P E R C O L U M B I A D R A I N A G EKETTLE RIVER

Boulder Road	18A2	1450	10/31	0	0.0	0.0	0.0	--
			11/12	0	0.0	0.0	0.0	--
			11/26	0	0.0	0.0	1.0	--
			12/10	5	1.0	0.0	1.0	--
			12/27	11	2.7	0.0	3.5	--
			1/10	12	2.8	0.0	5.5	--
Butte Creek	18A3	4070	10/31	0	0.0	0.0	1.1	--
			11/12	6	1.4	0.0	1.0	--
			11/26	8	1.9	0.0	1.9	--
			12/10	14	2.9	1.6	1.9	--
			12/27	18	3.4	1.9	5.4	--
			1/10	20	4.4	1.9	7.3	--
Cabin Creek	18A8	3170	10/31	0	0.0	0.0	1.0	--
			11/12	4	1.3	0.0	1.2	--
			11/26	5	1.0	0.0	2.1	--
			12/10	11	2.1	1.2	2.0	--
			12/27	16	4.1	1.8	4.7	--
			1/10	18	4.2	--	6.8	--
Goat Creek	18A4	3595	10/31	0	0.0	0.0	0.0	--
			11/12	3	1.0	0.0	0.0	--
			11/26	5	1.2	0.0	1.0	--
			12/10	10	1.9	1.4	1.0	--
			12/27	16	3.3	1.8	3.9	--
			1/10	17	3.8	1.1	6.1	--
Snow Caps Creek	18A5	2150	10/31	0	0.0	0.0	0.0	--
			11/12	0	0.0	0.0	0.0	--
			11/26	0	0.0	0.0	0.7	--
			12/10	6	0.8	0.0	1.0	--
			12/27	12	2.8	0.0	3.2	--
			1/10	13	2.8	0.0	5.2	--



APPENDIX 2

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT				
			1964		Past Record		
			Date of Depth Survey (In.)	Snow Content (In.)	Water Content (In.)	1943-57	Avg.

Snow Surveys Made Prior to February 1, 1964 (Cont'd)

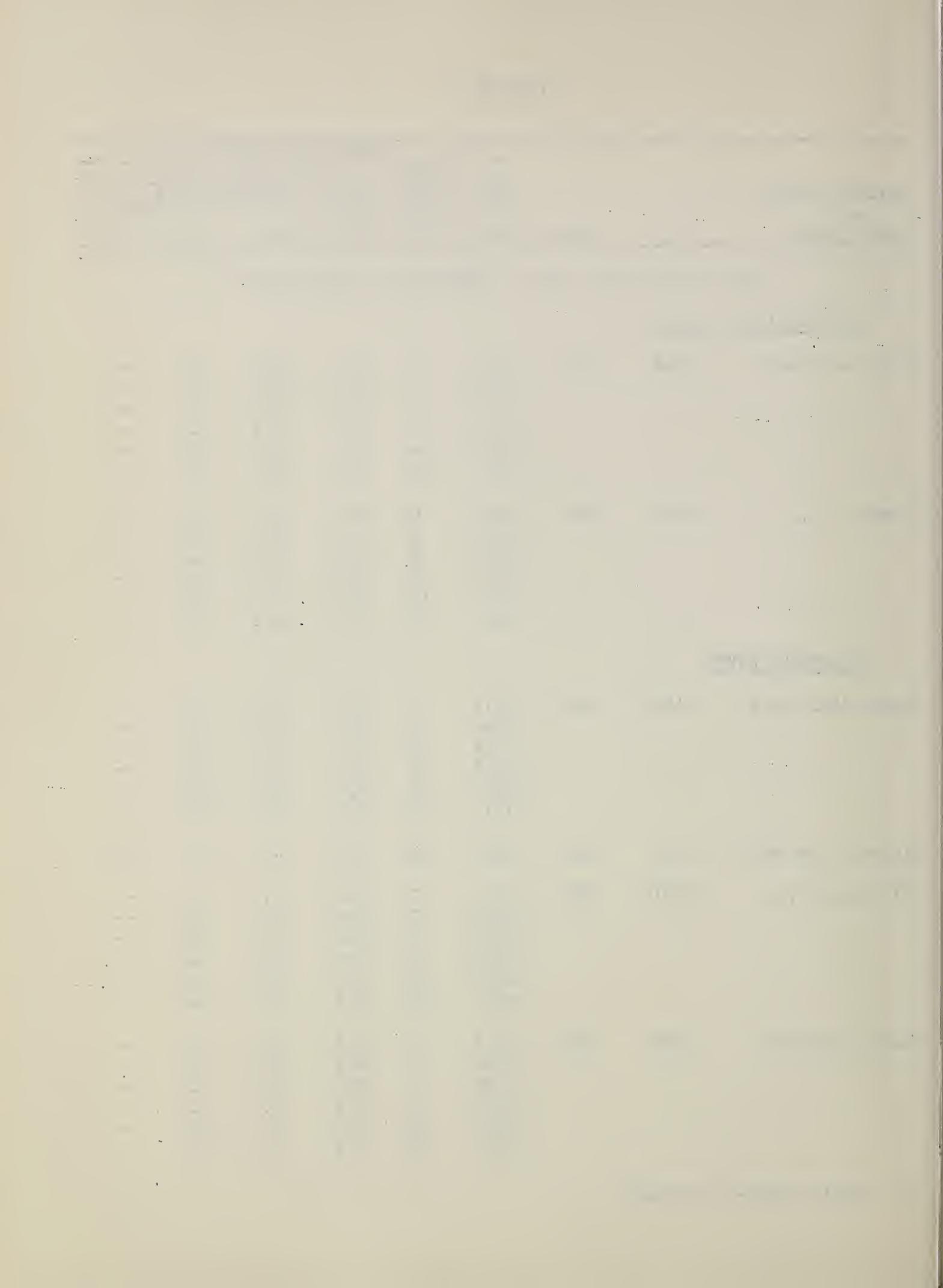
KETTLE RIVER (Cont'd)

Snow Caps Trail	18A6	2720	10/31	0	0.0	0.0	0.0	--
			11/12	0	0.0	0.0	0.0	--
			11/26	4	1.1	0.0	0.7	--
			12/10	9	1.8	1.3	1.2	--
			12/27	14	3.1	0.8	3.6	--
			1/10	16	3.5	0.0	5.4	--
Summit G.S.	18A7	4600	10/31	0	0.0	0.0	1.1	--
			11/12	5	1.4	0.4	1.0	--
			11/26	8	1.9	0.8	1.6	--
			12/10	13	2.8	1.5	2.4	--
			12/27	18	3.9	2.4	4.8	--
			1/10	19	4.4	2.2	7.4	--

WENATCHEE RIVER

Berne-Mill Creek	21B23	2925	10/31	0	0.0	0.0	1.2	--
			11/14	2	0.3	0.5	3.2	--
			11/27	10	2.1	4.3	7.5	--
			12/12	18	3.5	4.3	11.0	--
			12/27	36	8.6	5.6	19.8	--
			1/13	63	18.0	2.9	24.3	--
Blewett Pass No. 2	20B2	4270	12/30	22	4.6	0.0	11.3	8.1*
Chiwaukum G.S.	20B16	1810	10/31	0	0.0	0.0	0.0	--
			11/14	0	0.0	0.0	0.0	--
			11/27	2	0.4	1.2	3.6	--
			12/12	9	1.4	0.9	4.4	--
			12/27	20	3.6	0.8	8.0	--
			1/13	24	4.5	0.6	14.0	--
Lake Wenatchee	20B5	1970	10/31	0	0.0	0.0	0.0	--
			11/14	0	0.0	0.0	0.0	--
			11/27	1	0.1	1.9	3.7	--
			12/12	9	1.4	1.9	5.1	--
			12/27	23	4.8	1.4	10.5	--
			1/13	32	6.9	1.3	15.9	--

* Adjusted 1943-57 average.



APPENDIX 3

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT				
			1964		:P a s t R e c o r d		
			Date of Survey	Snow Depth (In.)	Water Content: (In.)	Water Content (In.)	1943-57
						:1963 1962 Avg.	

Snow Surveys Made Prior to February 1, 1964 (Cont'd)

WENATCHEE RIVER (Cont'd)

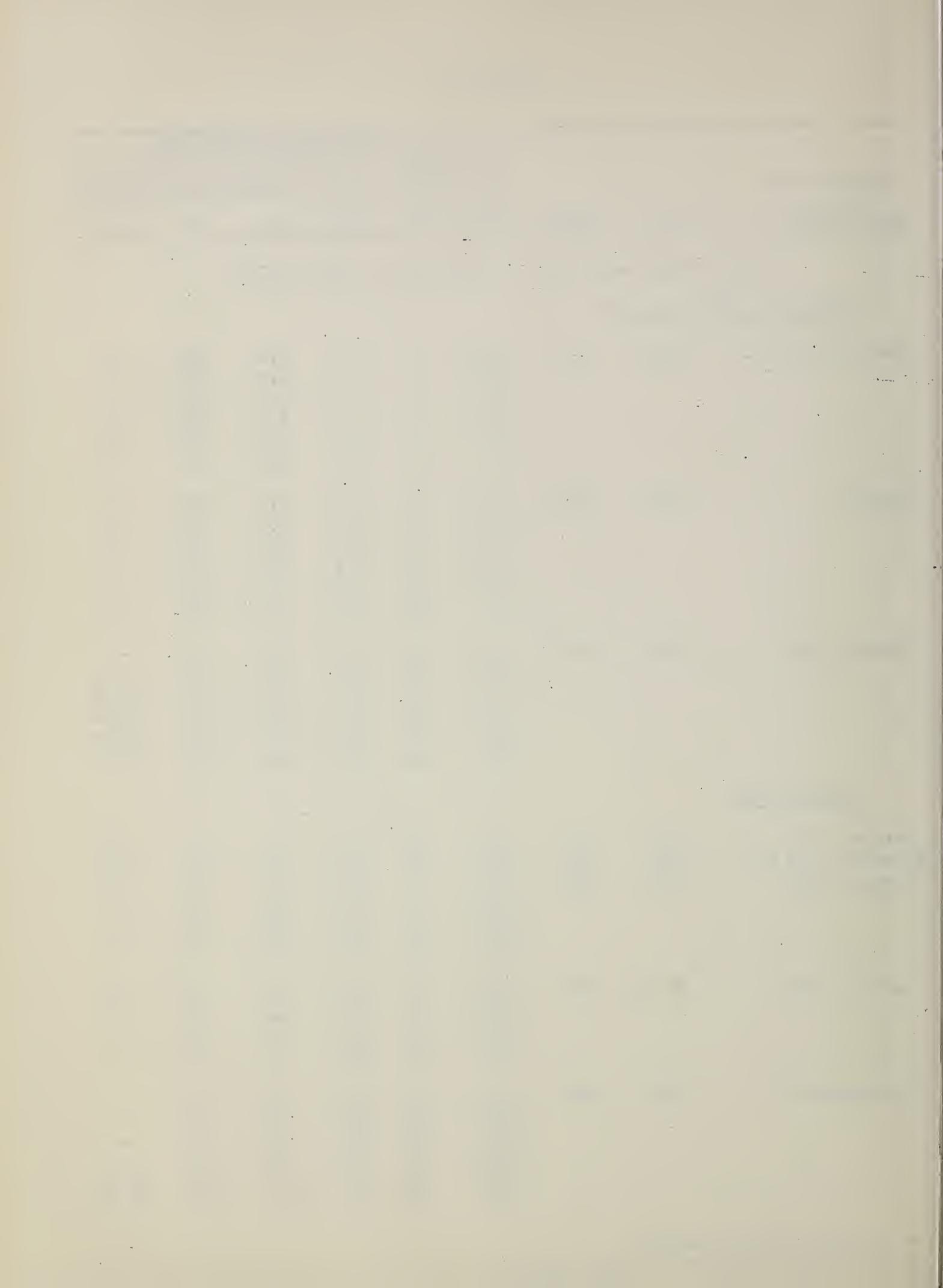
Leavenworth R.S.	20B17	1127	10/31	0	0.0	0.0	0.0	--
			11/15	0	0.0	0.0	0.0	--
			12/1	0	0.0	0.5	3.0	--
			12/10	7	1.0	0.0	7.8	--
			1/2	8	3.0	0.0	4.8	--
			1/10	10	2.6	0.0	5.5	--
Merritt	20B18	2140	10/31	0	0.0	0.0	0.0	--
			11/14	0	0.0	0.0	0.0	--
			11/27	3	0.7	2.9	5.0	--
			12/12	12	2.1	3.0	7.8	--
			12/27	30	5.9	2.7	14.7	--
			1/13	38	9.7	3.6	18.4	--
Stevens Pass	21B1	4070	10/31	19	4.0	0.0	3.4	--
			11/14	32	7.5	2.3	8.7	--
			11/27	55	12.0	8.7	14.4	11.8*
			12/12	60	16.8	10.8	20.3	15.5*
			12/27	82	24.0	13.2	31.5	22.2*
			1/13	114	30.8	12.2	37.2	26.2*

YAKIMA RIVER

Ahtanum R.S.	21C11	3100	12/27	13	2.2	0.0	5.5	4.8*
#Blewett Pass No. 2	20B2	4270	12/30	22	4.6	0.0	11.3	8.1*
Bumping Lake	21C8	3450	11/29	0	0.0	3.2	3.8	5.3*
			12/13	7	2.2	2.8	3.9	--
			12/30	20	4.8	2.9	10.2	8.1*
			1/14	36	8.4	2.6	7.6	--
Lake Cle Elum	21B14M	2200	11/29	0	0.0	1.0	2.8	1.8*
			12/13	6	1.4	1.0	4.4	--
			12/30	18	4.6	0.0	9.8	4.6
			1/14	34	8.4	--	4.6	--
#Stampede Pass	21B10	3000	11/5	14	2.7	0.0	1.5	--
			11/15	20	5.6	0.0	5.1	--
			12/3	28	10.1	5.9	9.3	--
			12/13	46	13.9	8.4	13.6	--
			12/31	59	17.4	13.6	25.3	20.6*
			1/14	99	25.9	15.3	26.4	24.9*

* Adjusted 1943-57 average

Not located directly on this drainage.



APPENDIX 4

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT				
			1964		Past Record		
			Date of Depth Survey (In.)	Snow Content (In.)	Water Content (In.)	1943-57	Avg.

Snow Surveys Made Prior to February 1, 1964 (Cont'd)

YAKIMA RIVER (Cont'd)

Tunnel Avenue	21B8	2450	11/29	0	0.0	3.3	4.2	4.5*
			12/13	15	4.2	4.5	6.1	--
			12/30	29	8.5	5.4	15.1	10.2
			1/14	52	13.6	5.3	14.4	--
White Pass	21C9	4500	11/30	30	8.4	--	--	--
			1/2	43	13.9	8.0	20.1	14.4*
White Pass(Ea.Side)	21C28	4500	12/13	27	6.5	5.9	--	--
			12/30	32	9.1	6.2	--	--
			1/14	48	12.2	7.5	--	--
White Pass(Leech Lk.)	21C27	4500	11/30	26	8.0	--	--	--
			1/2	37	11.7	7.2	17.6	--

AHTANUM CREEK

Ahtanum R. S.	21C11	3100	12/27	13	2.2	0.0	5.5	4.8*
---------------	-------	------	-------	----	-----	-----	-----	------

LOWER COLUMBIA DRAINAGEMILL CREEK

Walla Walla Div.	18D13	2400	12/27	0	0.0	0.0	0.0	--
------------------	-------	------	-------	---	-----	-----	-----	----

WHITE SALMON RIVER

Cultus Creek	21C12	4000	12/31	39	14.8	5.8	24.0	17.2*
#Surprise Lakes	21C13A	4250	12/31	46	19.3	7.1	27.8	21.4*

WIND RIVER

Oldman Pass	21D19	3100	12/30	4	1.2	0.9	8.3	--
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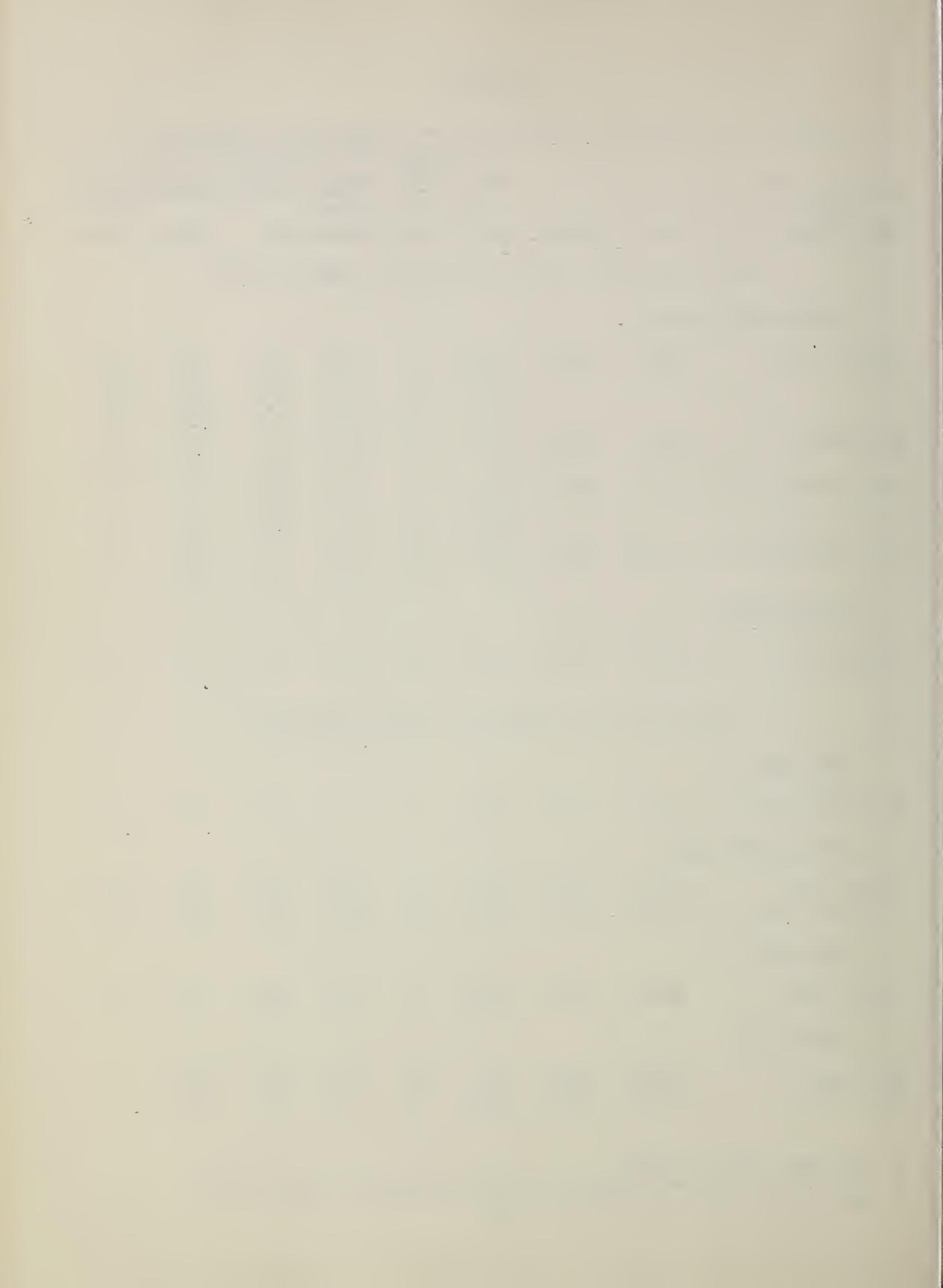
LEWIS RIVER

Blue Lake + Bob's Trail	21C22a	4800	1/11	118	34.2	24.4	36.1	--
	21C21	2200	12/30	0	0.0	0.0	10.9	--

* Adjusted 1943-57 average

+ Snow water equivalent estimated from aerial stadia observations

+ Not located directly on this drainage.



APPENDIX 5

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENTS					
			1964		Past Record			
			Date	Snow Depth	Water Content	Water Content (In.)	1943-57	
			of Survey	(In.)	(In.)	: 1963	1962	Avg.
Snow Surveys Made Prior to February 1, 1964 (Cont'd)								

LEWIS RIVER (Cont'd)

Calamity Ridge +	22C1A	2500	1/11	8	2.3	0.0	0.0	--
Council Pass +	21C18a	4200	1/11	64	18.6	9.4	21.6	--
#Cultus Creek	21C12	4000	12/31	39	14.8	5.8	24.0	17.2*
Divide Meadow +	21C29a	5600	1/11	79	22.9	17.8	30.4	--
Grand Meadow	21C25	3500	12/27	22	5.4	3.8	15.5	--
Marble Mountain +	22C5a	3200	1/11	32	9.3	0.0	--	--
New Muddy River	22C6	2000	12/27	0	0.0	New Course		
Oldman Pass	21D19	3100	12/30	4	1.2	0.9	8.3	--
Plains of Abraham +	22C1A	4400	1/11	86	24.9	14.8	28.1	21.5*
Smith Creek Road	22C4	2100	12/27	0	0.0	0.0	5.4	--
Spencer Meadow +	21C20a	3400	1/11	36	10.4	0.8	7.2	--
Surprise Lakes	21C13A	4250	12/31	46	19.3	7.1	27.8	21.4*
Table Mountain +	21C24a	4200	1/11	77	22.3	10.8	27.6	--
Timbered Peak +	21D18a	3000	1/11	31	9.0	0.0	--	--

COWLITZ RIVER

Pigtail Peak	21C33	5900	11/30	56	19.8	--	--	--
			1/2	71	24.4	--	--	--
Plains of Abraham +	22C1A	4400	1/11	86	24.9	14.8	28.1	21.5*
Ohanapekosh	21C32	2200	1/2	0	0.0	2.1	--	--
#White Pass	21C9	4500	11/30	30	8.4	--	--	--
			1/2	43	13.9	8.0	20.1	14.4*
#White Pass(Ea.Side)	21C28	4500	12/13	27	6.5	5.9	--	--
			12/30	32	9.1	6.2	--	--
			1/14	48	12.2	7.5	--	--
#White Pass(Leech Lk.)	21C27	4500	11/30	26	8.0	--	--	--
			1/2	37	11.7	7.2	17.6	--

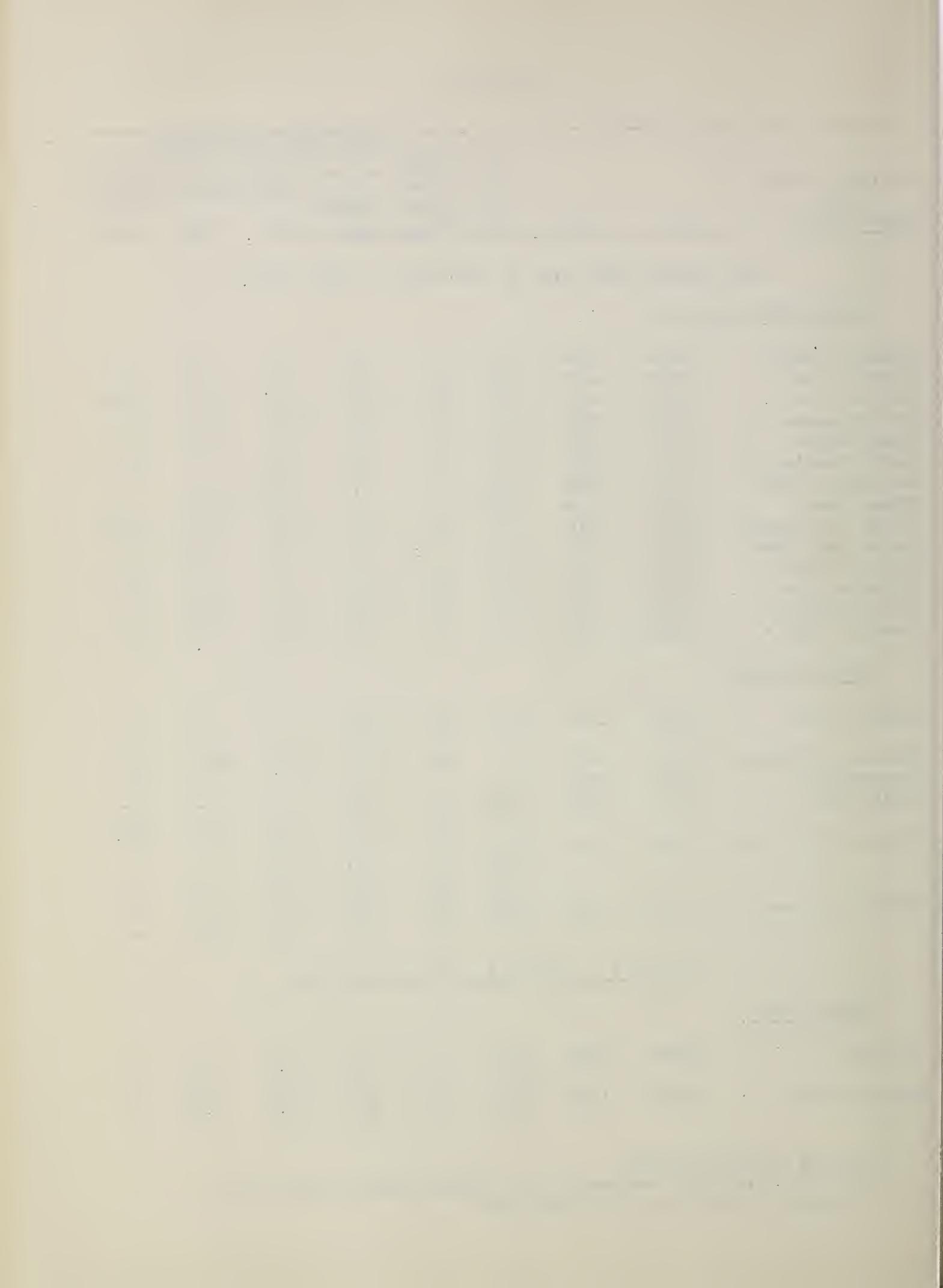
PUGET SOUND DRAINAGEGREEN RIVER

Airstrip	21B24	1800	11/30	0	0.0	2.8	0.0	--
			1/4	0	0.0	0.0	3.4	--
Charley Creek	21B25	1200	11/29	0	0.0	0.0	0.0	--
			1/4	0	0.0	0.0	0.0	--

* Adjusted 1943-57 average

+ Snow water equivalent estimated from aerial stadia observations.

Not located directly on this drainage.



APPENDIX 6

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT					
			1964		Past Record			
			Date of Survey	Snow Depth (In.)	Water Content (In.)	Water Content (In.)	1963	1962

Snow Surveys Made Prior to February 1, 1964 (Cont'd)

GREEN RIVER (Cont'd)

Grass Mtn. No. 1	21B26	4000	11/29	0	0.0	5.1	1.8	--
			1/4	19	7.3	2.5	11.9	--
Grass Mtn. No. 2	21B27	2900	11/29	0	0.0	4.1	2.8	--
			1/4	8	2.6	0.7	10.3	--
Grass Mtn. No. 3	21B28	2100	11/29	0	0.0	2.0	0.0	--
			1/4	0	0.0	0.0	1.6	--
Lester Creek	21B29	3100	11/30	12	2.2	--	6.0	--
			1/4	27	8.0	6.6	15.4	--
Sawmill Ridge	21B31	4700	11/30	32	9.0	7.8	9.0	--
			1/4	51	15.8	10.5	22.4	--
Stampede Pass	21B10	3000	11/5	14	2.7	0.0	1.5	--
			11/15	20	5.6	0.0	5.1	--
			12/3	28	10.1	5.9	9.3	--
			12/12	60	16.8	10.8	20.3	15.5*
			12/31	59	17.4	13.6	25.3	20.6*
			1/14	99	25.9	15.3	26.4	24.9*
Twin Camp	21B30	4100	11/30	12	3.3	7.8	6.2	--
			1/4	35	10.3	8.0	15.7	--

SKYKOMISH RIVER

#Stevens Pass	21B1	4070	10/31	19	4.0	0.0	3.4	--
			11/14	32	7.5	2.3	8.7	--
			11/27	55	12.0	8.7	14.4	11.8*
			12/12	60	16.8	10.8	20.3	15.5*
			12/27	82	24.0	13.2	31.5	22.2*
			1/13	114	30.8	12.2	37.2	26.2*

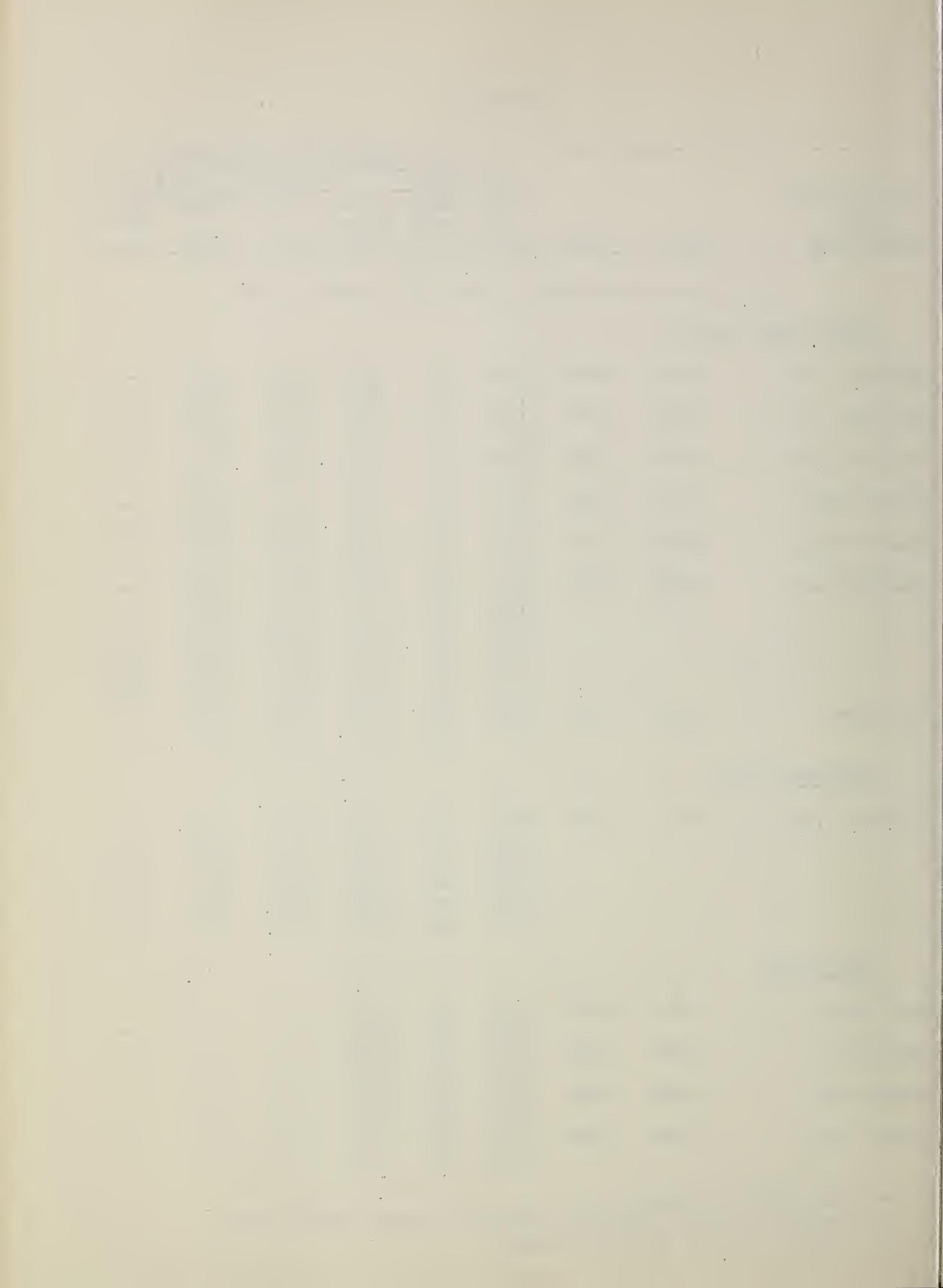
BAKER RIVER

Dock Butte +	21A11A	3800	11/11	66	19.8	--	--	--
			12/12	68	27.2	--	--	--
Easy Pass +	21A7A	5200	11/11	61	18.3	--	--	--
			12/12	70	28.0	--	--	--
Jasper Pass +	21A6A	5400	11/11	78	23.4	--	--	--
			12/12	82	32.8	--	--	--
Marten Lake +	21A9A	3600	11/11	56	14.0	--	--	--
			12/12	70	28.0	--	--	--

* Adjusted 1943-57 average.

+ Snow water equivalent estimated from aerial stadia observations.

Not located directly on this drainage.



APPENDIX 7

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT					
			1964		:P a s t R e c o r d		Date	Snow of Depth Content:
			Survey (In.)	(In.)	:1963	1962		
								1943-57

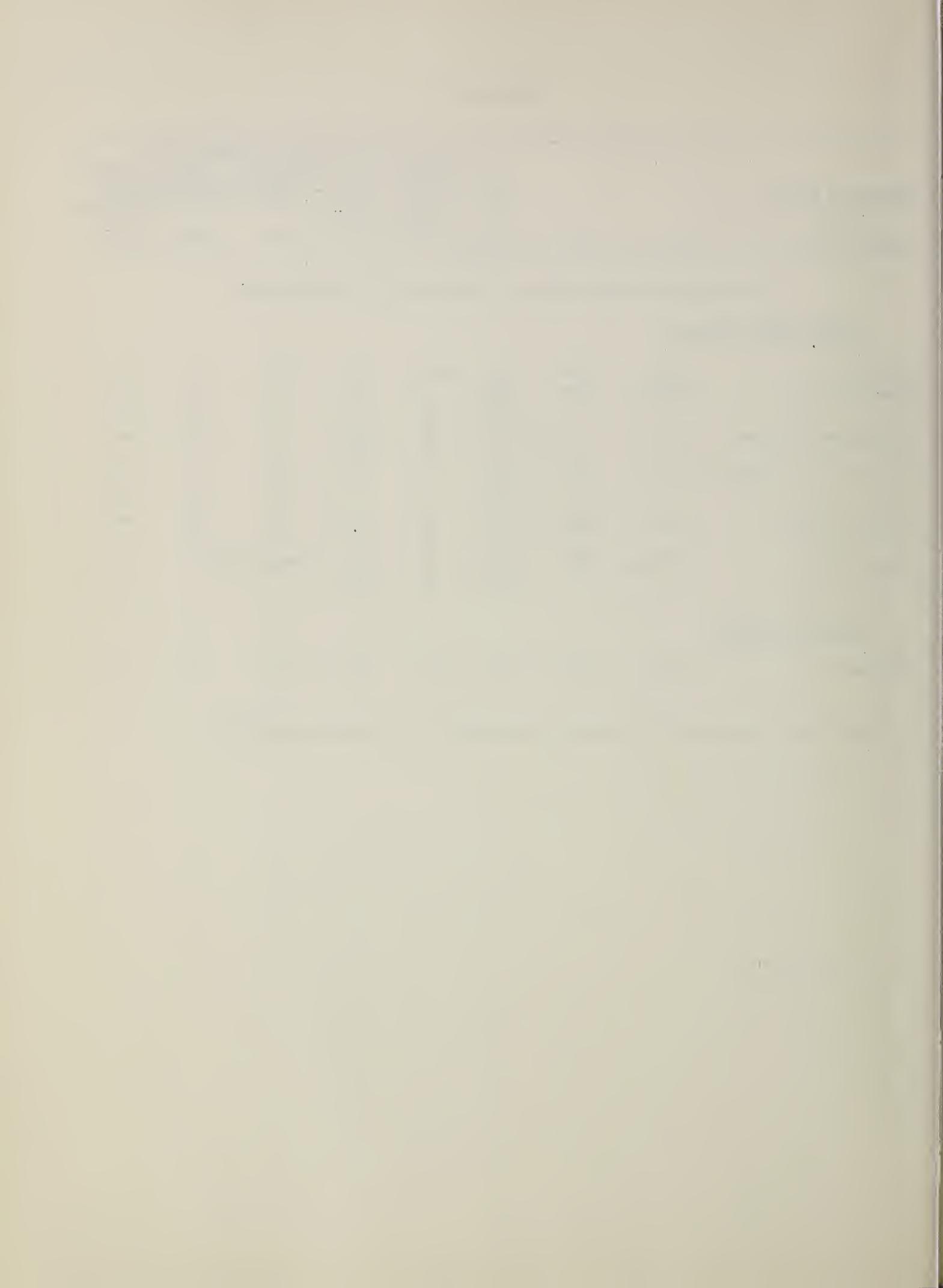
Snow Surveys Made Prior to February 1, 1964 (Cont'd)BAKER RIVER (Cont'd)

Panorama	21A5	4300	1/15	135	49.7	39.1	--	--
Rocky Creek +	21A12A	2100	11/11	0	0.0	--	--	--
			12/12	21	7.4	--	--	--
Schreibers Meadow +	21A10A	3400	11/11	51	12.8	--	--	--
			12/12	67	26.8	--	--	--
S.F. Thunder Creek +	21A14A	2200	11/11	0	0.0	--	--	--
			12/12	3	1.0	--	--	--
Watson Lakes +	21A8A	4500	11/11	48	12.0	--	--	--
			12/12	57	22.8	--	--	--
Mount Blum +	21A18a	5800	11/11	53	13.2	New Course		
			12/12	72	28.8			

NOOKSACK RIVER

Panorama	21A5	4300	1/15	135	49.7	39.1	--	--
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+ Snow water equivalent estimated from aerial stadia observations.



APPENDIX 8

SNOW DATA FEBRUARY 1, 1964

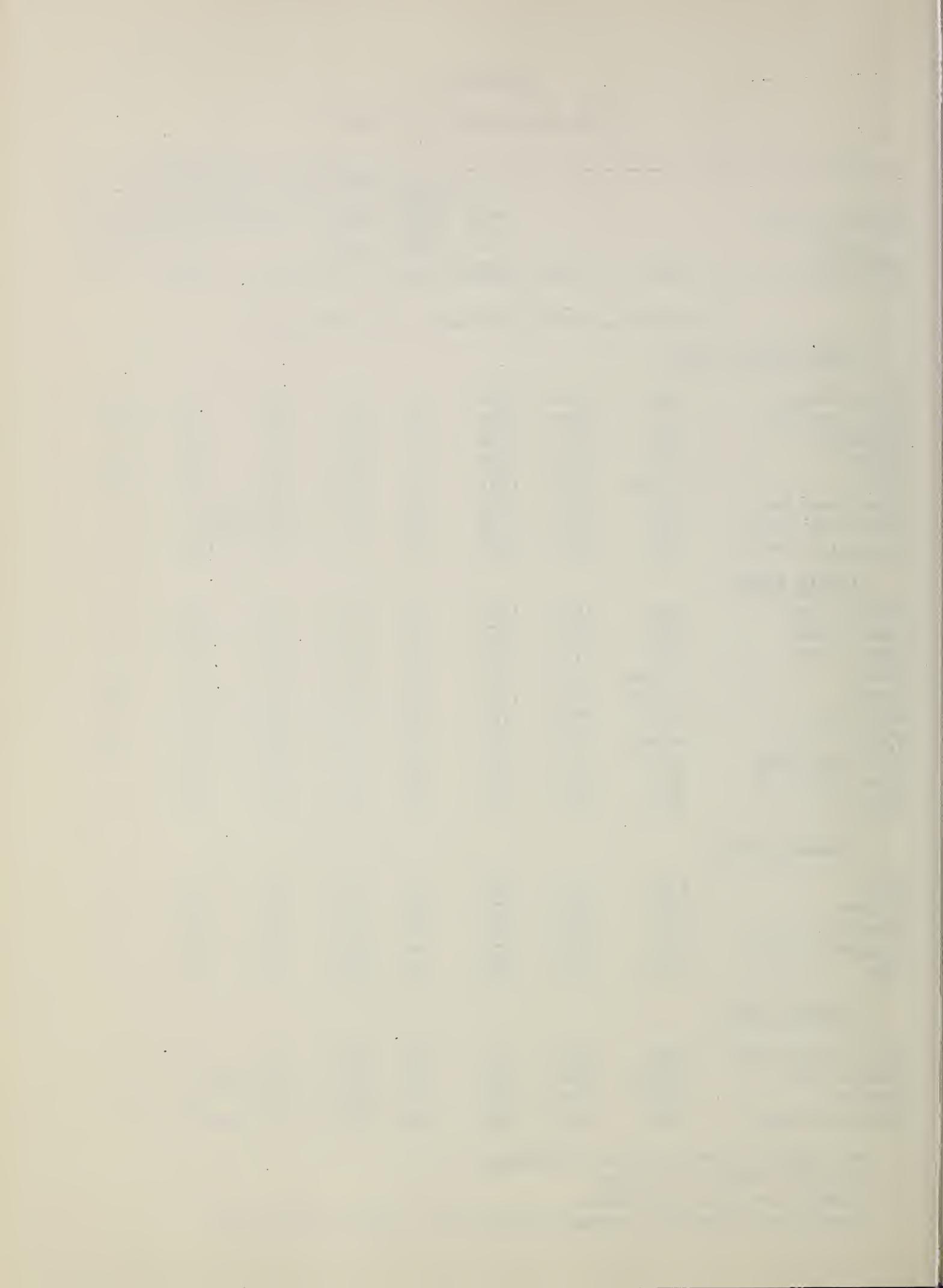
DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT							
			1964		Past Record					
			Date of Survey	Snow Depth (In.)	Water Content (In.)	Water Content (In.)	1943-57	Avg.		
<u>UPPER COLUMBIA DRAINAGE</u>										
<u>PEND OREILLE RIVER</u>										
Benton Meadow	16A2	2344	1/30	32	7.6	1.0	6.6	5.5		
Benton Spring	16A3	4900	1/27	54	14.2	7.8	15.6	15.4		
#Chewelah	17A4	4925	1/26	47	13.8	6.1	13.0	--		
Lookout	15B2	5250	1/30	97	26.7	14.5	28.8	25.9*		
Nelson	Canada	3050	1/31	54	14.9	5.6	12.8	11.4		
Schweitzer Bowl	16A6	4500	1/29	91	27.4	New Course				
Schweitzer Ridge	16A5	6100	1/29	108	34.0	New Course				
Winchester Creek	17A3	2970	1/27	43	11.0	2.6	13.0	--		
<u>KETTLE RIVER</u>										
Boulder Road	18A2	1450	1/27	24	5.3	0.0	6.5	--		
Butte Creek	18A3	4070	1/27	30	6.9	1.6	8.0	--		
Cabin Creek	18A8	3170	1/27	26	5.6	1.2	7.2	--		
Carmi	Canada	4100	1/31	26	6.0	2.0	--	--		
Farron	Canada	4000	1/30	42	11.3	4.9	10.0	9.9		
Goat Creek	18A4	3595	1/27	26	5.5	0.8	7.0	--		
Monashee Pass	Canada	4500	1/31	37	9.5	8.1	12.1	9.2**		
Snow Caps Creek	18A5	2150	1/27	22	5.1	0.0	6.5	--		
Snow Caps Trail	18A6	2720	1/27	25	5.2	0.0	7.1	--		
Summit G. S.	18A7	4600	1/27	27	6.4	2.4	6.6	--		
<u>COLVILLE RIVER</u>										
Baird	17A6	3215	1/27	29	6.6	0.8	7.8	--		
Carlson	18A9	2885	1/30	26	5.0	0.0	4.8	--		
Chewelah	17A4	4925	1/26	47	13.8	6.1	13.0	--		
Stranger Mountain	17A5	4990	1/30	49	13.6	2.8	11.2	--		
Togo	18A10	3370	1/28	43	10.8	1.7	9.1	--		
<u>SPOKANE RIVER</u>										
4th of July Summit	16B3	3100	1/31	40	10.9	1.7	9.8	--		
Granite Peak +	15B13A	6000	1/28	93	30.1	New Course				
#Lookout	15B2	5250	1/30	97	26.7	14.5	28.8	25.9*		
Medicine Ridge +	15B4A	6150	1/28	109	35.3	New Course				

Not located directly on this drainage

* Adjusted 1943-57 average.

** Average for years of record.

+ Snow water equivalent estimated from aerial stadia observation.



APPENDIX 2

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT					
			1964		Past Record			
			Date of Survey (In.)	Snow Depth (In.)	Water Content (In.)	Water Content (In.)	1943-57	
								1962 Avg.

SPOKANE RIVER (Cont'd)

Outlaw Creek +	15B12A	3750	1/28	59	15.6	--	--	--
Sherwin	16C1	3200	2/1	55	14.1	3.0	--	--

OKANOGAN RIVER

Aberdeen Lake	Canada	4300	1/30	22	4.5	2.1	6.6	4.9**
Blackwall Mountain	Canada	6250	Late Report		--	18.2	--	
Bouleau Creek	Canada	5000	Late Report		--	--	--	
Brookmere	Canada	3200	2/1	38	10.1	5.3	4.7	9.4**
Clark +	19A8a	7000	2/1	64	16.1	8.1	--	--
Copper Mountain	Canada	4300	1/30	25	6.0	2.7	4.9	5.2**
Hamilton Hill	Canada	4900	1/31	45	11.3	7.6	11.1	--
#Harts Pass	20A5A	6500	1/31	118	35.2	23.9	28.3	31.0*
#Horseshoe Basin +	19A5a	7000	1/28	48	12.0	4.5	10.5	--
Lost Horse Mountain	Canada	6300	1/31	33	7.7	4.4	7.4	--
#Loup Loup	19A7	4650	1/29	35	6.8	2.8	3.8	--
McCulloch	Canada	4200	2/1	26	5.8	2.5	7.6	5.6
Missezula Mountain	Canada	5100	Late Report		3.4	6.3	--	
Mission Creek	Canada	6000	1/30	53	14.4	9.6	15.9	--
Monashee Pass	Canada	4500	1/31	37	9.5	8.1	12.1	9.2**
Muckamuck +	19A9a	6390	2/1	45	11.3	6.5	--	--
Mutton Creek No. 1	19A1	5700	1/29	45	7.3	5.4	3.4	9.4*
Mutton Creek No. 2	19A4	6000	1/29	46	11.6	5.9	4.6	9.8*
New Copper Mountain	Canada	4300	1/29	27	6.6	3.0	5.2	4.9**
Paysayten +	20A28a	4300	1/28	60	15.0	--	3.8	--
Postill Lake	Canada	4500	Late Report		3.3	8.0	5.7**	
Rusty Creek	19A3	4000	2/1	29	5.3	1.0	4.0	6.0*
Salmon Meadows	19A2	4500	1/28	40	9.2	3.7	4.6	8.0*
Silver Star Mountain	Canada	6050	2/1	66	11.6	11.1	16.0	14.7**
Starvation Mountain +	19A10a	6750	2/1	66	16.6	9.7	--	--
Touts Coulee	19A6	2845	1/29	20	3.6	1.0	2.2	--
Trout Creek	Canada	4700	1/31	29	6.3	2.1	7.3	5.3

METHOW RIVER

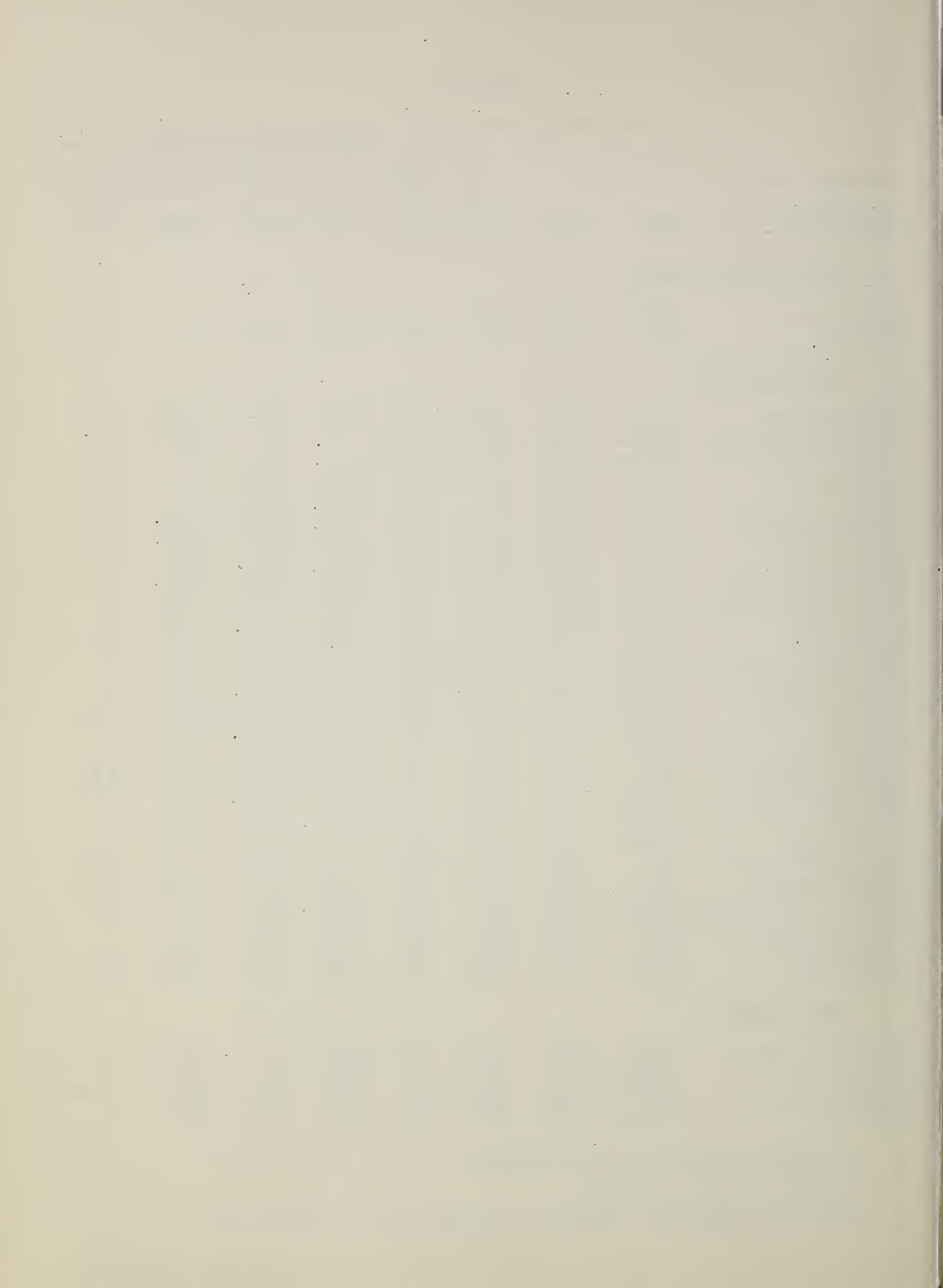
Billy Goat Pass +	20A10a	6400	1/28	95	23.8	--	10.1	--
Dollar Watch +	20A29a	7000	1/28	81	20.2	--	10.4	--
Harts Pass	20A5A	6500	1/31	118	35.2	23.9	28.3	31.0*
Horseshoe Basin +	19A5a	7000	1/28	48	12.0	4.5	10.5	--

Not located directly on this drainage.

* Adjusted 1943-57 average.

** Average for years of record.

+ Snow water equivalent estimated from aerial stadia observation.



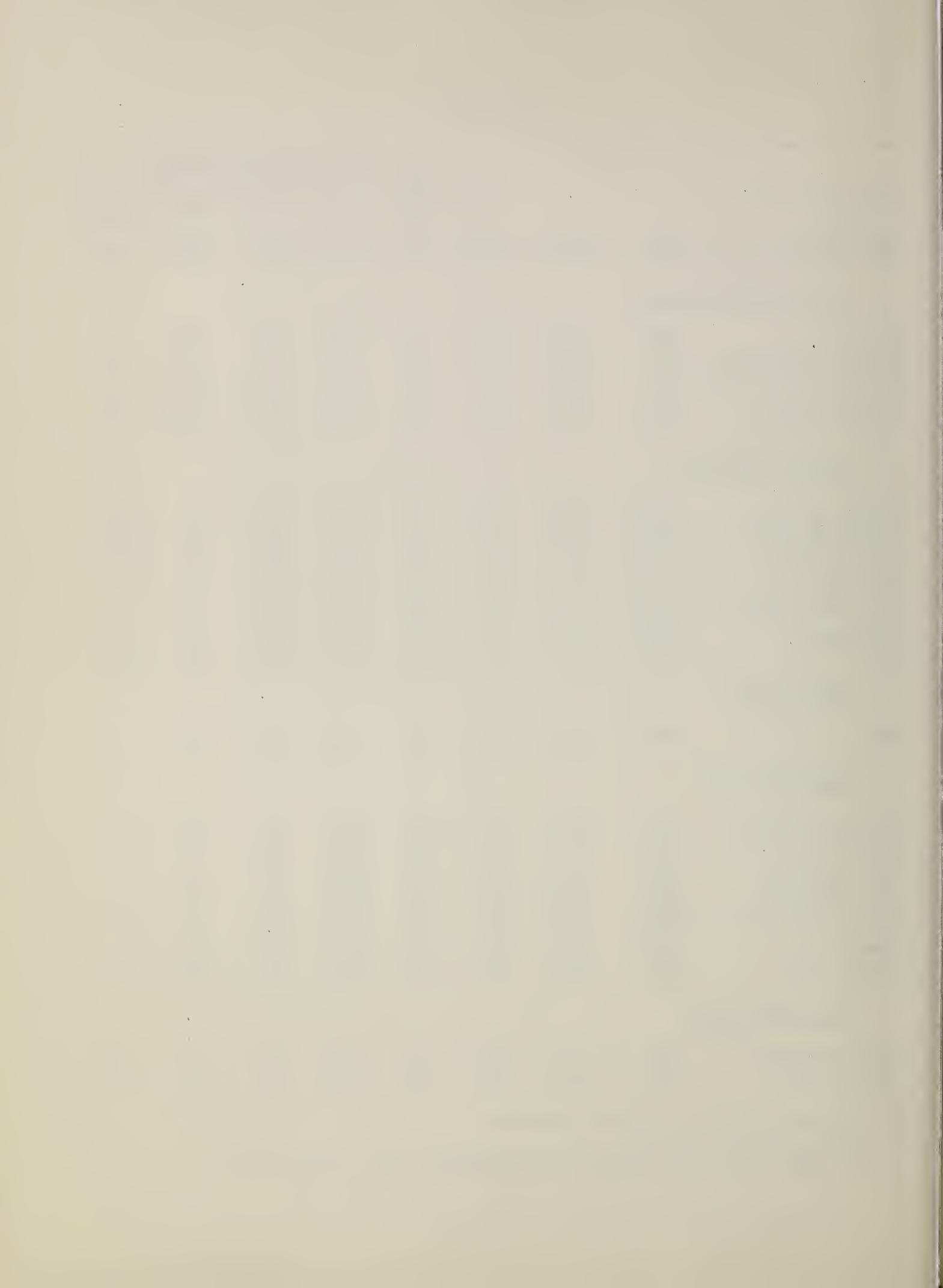
APPENDIX 10

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT					
			Date of Survey	Snow Depth (In.)	Water Content (In.)	:Past Record		
						1964	1963	1962
<u>METHOW RIVER (Cont'd)</u>								
Loup Loup	19A7	4650	1/29	35	6.8	2.8	3.8	--
#Mutton Creek No. 1	19A1	5700	1/29	45	7.2	5.4	3.4	9.4*
#Mutton Creek No. 2	19A4	6000	1/29	46	11.6	5.9	4.6	9.8*
#Rusty Creek	19A3	4000	2/1	29	5.3	1.0	4.0	6.0*
#Salmon Meadows	19A2	4500	1/28	40	9.2	3.7	4.6	8.0*
<u>CHELAN LAKE BASIN</u>								
Cloudy Pass +	20A22A	6500	1/28	92	23.0	20.1	--	29.2*
Greenwood Flat +	20A25A	3540	1/28	97	24.2	6.8	--	23.2*
Little Meadows +	20A24A	5275	1/28	110	27.5	19.0	--	32.0*
Lyman Lake +	20A23A	5900	1/28	130	32.5	32.0	--	43.4*
Park Creek Flat +	20A13A	2220	1/28	102	25.2	16.3	--	--
Park Creek Ridge +	20A12A	4600	1/28	138	34.5	22.4	--	--
Petersons +	20A16a	3730	1/28	84	21.0	19.4	--	--
Rainy Pass	20A9	4780	1/31	123	28.4	20.6	26.8	29.9*
<u>ENTIAT RIVER</u>								
Brief	20B19	1600	1/26	42	7.5	0.0	5.0	--
<u>WENATCHEL RIVER</u>								
Berne-Mill Creek	21B23	2925	1/29	101	26.8	5.2	18.5	--
Blewett Pass No. 2	20B2	4270	1/30	54	14.3	0.6	11.4	12.8*
Chiwaukum G. S.	20B16	1810	1/30	52	10.9	0.0	9.4	--
Lake Wenatchee	20B5	1970	1/30	67	15.4	1.1	11.1	--
Leavenworth R. S.	20B17	1127	1/27	35	6.7	0.5	3.4	--
#Lyman Lake +	20A23A	5900	1/28	130	32.5	32.0	--	43.4*
Merritt	20B18	2140	1/30	72	18.4	2.9	12.2	--
Stevens Pass	21B1	4070	1/29	164	48.9	19.4	38.5	34.8*
<u>SQUILCHUCK CREEK</u>								
Beehive Springs	20B3	4400	1/28	27	6.9	0.0	5.1	5.6*
Scout-A-Vista	20B4	3400	1/28	30	6.3	0.0	5.2	6.3*

Not located directly on this drainage.

* Adjusted 1943-57 average.

+ Snow water equivalent estimated from aerial stadia observation.



APPENDIX 11

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	Date of Survey	SNOW COVER MEASUREMENTS				
				1964	:Past Record			
				Snow Depth (In.)	Water Content: (In.)	Water Content: (In.)	1943-57	Avg.

STEMILT CREEK

Jump-Off	20B8	4450	1/27	25	6.4	0.0	3.2	--
Stemilt Slide	20B6	5000	1/27	43	10.7	3.5	8.8	--
Upper Wheeler	20B7	4400	1/27	34	9.0	0.0	6.1	--

YAKIMA RIVER

Ahtanum R. S.	21C11	3100	1/27	22	4.7	0.0	5.4	6.8*
#Blewett Pass No. 2	20B2	4270	1/30	54	14.3	0.6	11.4	12.8*
Bumping Lake	21C8	3450	1/30	57	15.2	2.9	7.5	14.2
#Cayuse Pass	21C6	5300	2/3	212	81.6	31.4	51.4	61.6*
Clockum Pass	20B9	5370	Not Measured			3.9	9.2	--
Cooke Creek	20B10	4123	Not Measured			0.0	6.2	--
Grouse Camp	20B11	5385	Not Measured			4.2	9.7	--
High Creek	20B12	2930	1/29	28	6.0	0.0	6.4	--
Lake Cle Elum	21B14M	2200	1/30	53	14.2	0.0	3.7	9.5
Manashtash	20C1	3935	1/28	19	5.1	0.0	0.0	--
Morse Lake	21C17	5400	1/29	148	47.0	21.1	33.3	38.4*
Nanum	20B13	3875	Not Measured			0.0	8.5	--
#Olallie Meadows	21B2	3625	1/28	141	45.6	16.8	29.0	31.8*
#Satus Pass	20D1	4030	2/3	28	9.5	0.5	5.2	--
#Stampede Pass	21B10	3000	1/31	149	33.9	16.1	28.0	34.3*
Trail Creek	20B14	3360	Not Measured			0.0	0.0	--
Tunnel Avenue	21B8	2450	1/29	93	27.9	4.3	15.6	19.1
Walters Flat	20B15	3360	1/29	32	6.6	0.0	7.2	--
White Pass	21C9	4500	2/1	101	33.1	11.1	21.6	22.8*
White Pass (Ea.Side)	21C28	4500	1/30	69	20.1	6.7	14.8	19.0*
White Pass (Leech Lk.)	21C27	4500	2/1	85	28.0	7.4	17.3	--

AHTANUM CREEK

Ahtanum R. S.	21C11	3100	1/27	22	4.7	0.0	5.4	6.8*
---------------	-------	------	------	----	-----	-----	-----	------

LOWER COLUMBIA DRAINAGEMILL CREEK

Homestead	17C1	4030	1/27	30	8.4	1.7	4.8	--
Martin Springs	17C2	4400	1/27	42	12.6	3.2	9.2	--
Walla Walla Div.	18D13	2400	1/27	15	4.9	0.0	0.0	--

Not located directly on this drainage.

* Adjusted 1943-57 average.

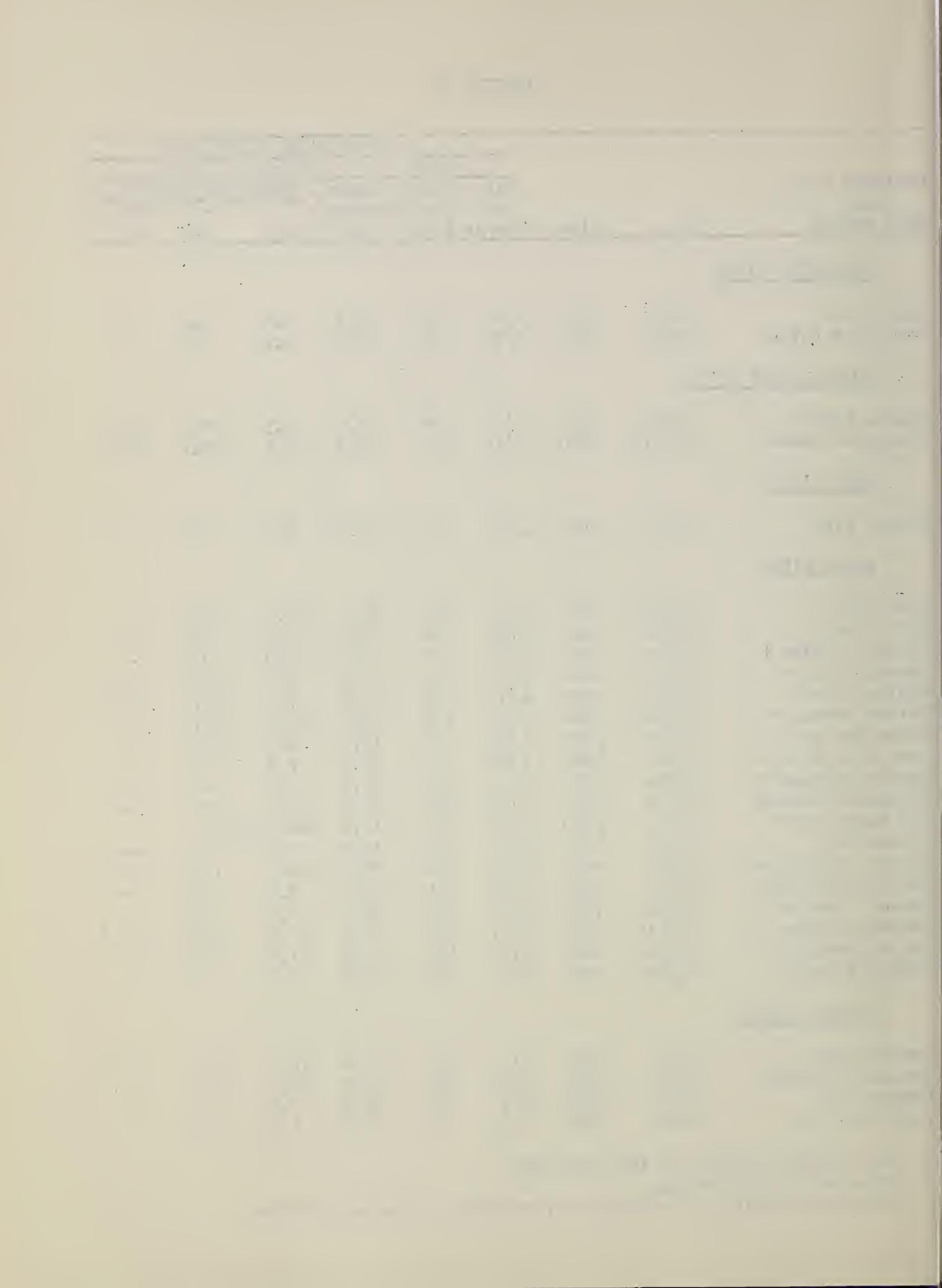
APPENDIX 12

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT					
			1964		:P a s t R e c o r d		1943-57	
			Date of Survey	Snow Depth (In.)	Water Content (In.)	Water Content (In.) :1963		
<u>KLICKITAT RIVER</u>								
Satus Pass	20D1	4030	2/3	28	9.5	0.5	5.2	--
West Fork Cabin	21C15	3000	1/29	28	8.3	0.0	5.7	--
<u>WHITE SALMON RIVER</u>								
Cultus Creek	21C12	4000	2/3	88	35.5	9.5	26.2	30.3*
#Surprise Lakes	21C13A	4250	1/31	111	43.5	11.6	27.8	33.4*
<u>WIND RIVER</u>								
Oldman Pass	21D19	3100	2/2	40	14.8	0.0	7.7	--
<u>LEWIS RIVER</u>								
Blue Lake +	21C22a	4800	2/2	192	69.1	26.4	39.6	--
Bob's Trail	21C21	2200	1/30	38	14.3	0.0	6.0	--
Calamity Ridge +	22D1a	2500	2/2	8	2.8	0.0	0.0	--
Council Pass +	21C18a	4200	2/2	112	40.3	9.7	22.4	--
#Cultus Creek	21C12	4000	2/3	88	35.5	9.5	26.2	30.3*
Divide Meadow +	21C29a	5600	2/2	136	49.0	19.2	32.4	--
Grand Meadow	21C25	3500	1/30	60	18.8	6.5	13.5	--
Lone Pine Shelter	21C26	3800	1/28	92	30.3	7.3	20.4	--
Marble Mountain +	22C5a	3200	2/2	60	27.6	3.0	--	--
#Mosquito Meadows	21C19	4100	1/29	104	34.3	10.7	25.1	--
New Muddy River	22C6	2000	1/31	29	11.2	New Course		
Oldman Pass	21D19	3100	2/2	40	14.8	0.0	7.7	--
Plains of Abraham +	22C1A	4400	2/2	138	49.7	18.0	33.9	40.0*
Smith Creek Road	22C4	2100	1/30	31	11.1	0.0	3.8	--
Spencer Meadow +	21C20a	3400	2/2	53	23.3	2.6	5.6	--
Surprise Lakes	21C13A	4250	1/31	111	43.5	11.6	27.8	33.4*
Table Mountain +	21C24a	4200	2/2	122	43.9	11.7	24.8	--
Timbered Peak +	21D18a	3000	2/2	38	13.7	0.0	--	--
<u>COWLITZ RIVER</u>								
Cayuse Pass	21C6	5300	2/3	212	81.6	31.4	51.4	61.6*
Mosquito Meadows	21C19	4100	1/29	104	34.3	10.7	25.1	--
Ohanapecosh	21C32	2200	2/1	48	16.6	2.2	--	--
Packwood Lake	21C31	2870	1/23	37	7.8	1.0	8.5	--

Not located directly on this drainage.

* Adjusted 1943-57 average.

+ Snow water equivalent estimated from aerial stadia observation.



APPENDIX 13

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT					
			1964		:Past Record			
			Date of Survey	Snow Depth (In.)	Water Content (In.)	Water Content (In.)	1943-57	
								1962 Avg.

COWLITZ RIVER (Cont'd)

Pigtail Peak	21C33	5900	2/1	156	56.2	--	--	--
Plains of Abraham +	22C1A	4400	2/2	138	49.7	18.0	33.9	40.0*
Potato Hill	21C14	4500	1/28	75	23.0	9.0	16.2	20.8*
#White Pass	21C9	4500	2/1	101	33.1	11.1	21.6	22.8*
#White Pass(Ea.Side)	21C28	4500	1/30	69	20.1	6.7	14.8	19.0*
#White Pass(Leech L.)	21C27	4500	2/1	85	28.0	7.4	17.3	--
Willame Creek	21C30	3250	1/29	80	24.9	7.7	21.1	--

PUGET SOUND DRAINAGENISQUALLY RIVER

Ghost Forest	21C4	4550	1/28	123	41.0	12.6	31.4	29.5*
Longmire	21C3	2760	1/28	44	12.3	0.7	6.8	12.3*
Paradise Park	21C2	5500	1/28	192	66.2	24.7	52.6	46.8*
Stem Glade	21C1	5050	1/28	174	58.6	25.2	47.0	47.1*

WHITE RIVER

#Cayuse Pass	21C6	5300	2/3	212	81.6	31.4	51.4	61.6*
#Morse Lake	21C17	5400	1/29	148	47.0	21.1	33.3	38.4*
White R. Entrance	21C5	3600	2/3	54	32.0	3.9	4.6	12.2*
White R. Entr. New	21C16	3400	2/3	28	9.3	1.5	4.6	7.0*

GREEN RIVER

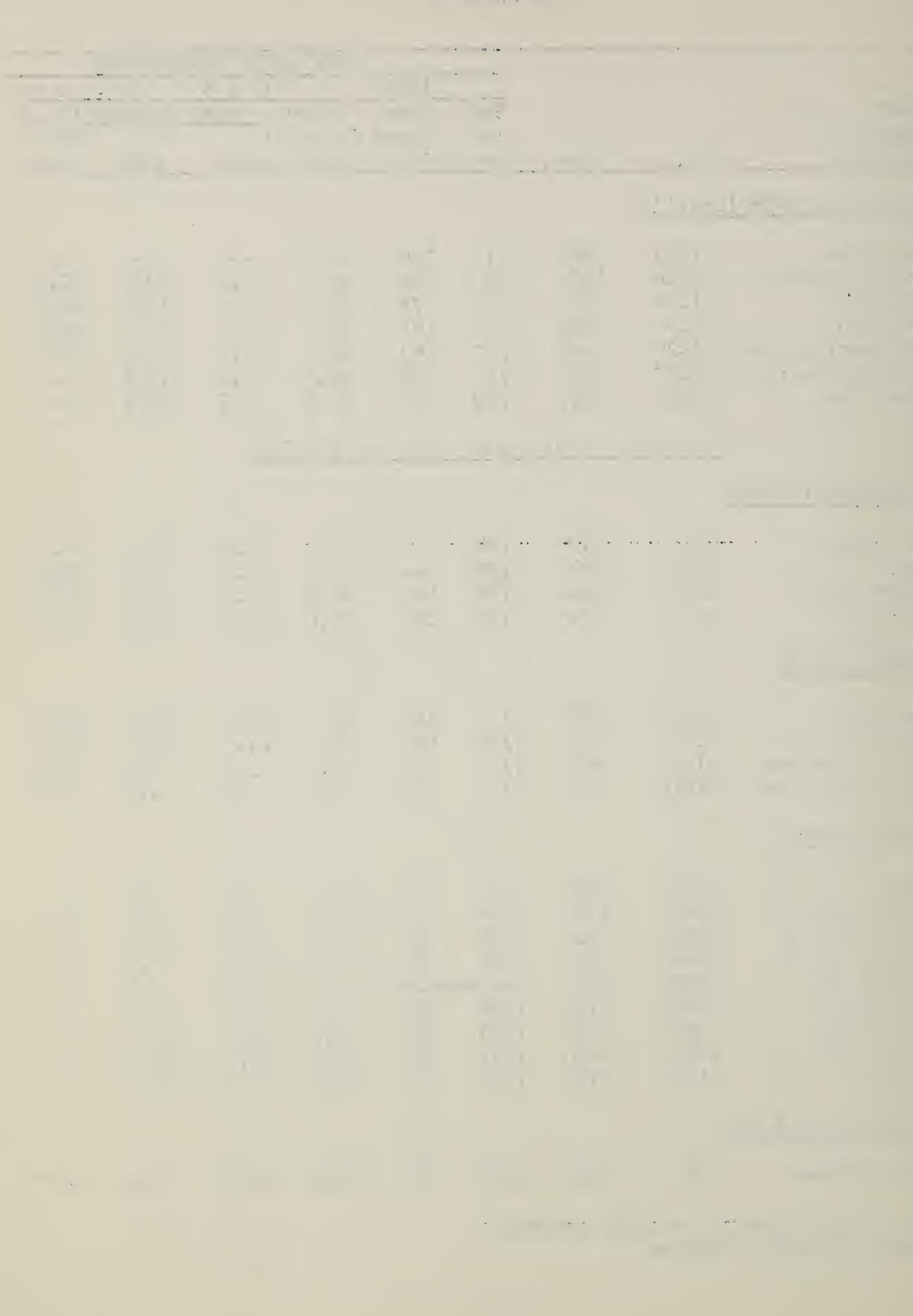
Airstrip	21B24	1800	1/28	37	10.2	0.0	0.0	--
Charley Creek	21B25	1200	1/29	6	3.2	0.0	0.0	--
Grass Mtn. No. 1	21B26	4000	1/28	58	21.2	4.0	12.3	--
Grass Mtn. No. 2	21B27	2900	1/28	58	20.8	1.0	8.5	--
Grass Mtn. No. 3	21B28	2100	Not Measured		0.0	0.0	0.0	--
Lester Creek	21B29	3100	1/28	73	20.6	6.4	16.0	--
Sawmill Ridge	21B31	4700	1/28	106	35.2	13.0	28.0	--
Stampede Pass	21B10	3000	1/31	149	33.9	16.1	28.0	34.3*
Twin Camp	21B30	4100	1/28	78	25.8	8.3	17.3	--

SNOQUALMIE RIVER

Olallie Meadows	21B2	3625	1/28	141	45.6	16.8	29.0	31.8*
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Not located directly on this drainage.

* Adjusted 1943-57 average.



APPENDIX 14

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENT					
			1964		Past Record			
			Date of Survey	Snow Depth (In.)	Water Content (In.)	Water Content (In.)	1943-57	
								Avg.

SKYKOMISH RIVER

#Stevens Pass	21B1	4070	1/29	164	48.9	19.4	38.5	34.8*
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SKAGIT RIVER

#Cloudy Pass + Devils Park #Harts Pass Klesilkwa #Lyman Lake + New Tashme #Rainy Pass	20A22A 20A4 20A5A Canada 20A23A Canada 20A9	6500 5900 6500 3700 5900 2500 4780	1/28 1/28 1/31 Late Report 1/28 Late Report 1/31	92 112 118 Report 130 Report 123	23.0 36.0 35.2 3.8 32.5 3.8 28.4	20.1 24.9 23.9 7.0 32.0 6.4 20.6	-- 30.3 28.3 10.6** -- 43.4* 26.8	29.2* 30.2* 31.0* 10.6** 43.4* 7.5** 29.9*
---	---	--	--	--	--	--	---	--

BAKER RIVER

Dock Butte Easy Pass Jasper Pass Koma Kulshan Marten Lake Mount Blum #Panorama Rocky Creek Schreibers Meadow S. F. Thunder Creek Sulphur Creek Three Mile Creek Watson Lakes	21A11A 21A7A 21A6A 21A17 21A9A 21A18a 21A5 21A12A 21A10A 21A14A 21A13 21A15 21A8A	3800 5200 5400 800 3600 5800 4300 2100 3400 2200 1600 1600 4500	Not Measured Not Measured 2/5 2/3 2/5 Not Measured 2/1 2/5 2/3 2/3 2/3 Not Measured 2/5	218 16 170 196 62 155 22 32 22 32 143	79.3 6.5 64.5 77.6 22.2 57.3 7.9 12.0 2.6 2.3 1.9 27.3	45.0 1.4 32.8 39.8 6.0 24.9 2.6 12.0 0.0 9.5 0.0 42.1	47.8 53.2 60.1 7.2 45.6 41.6 0.0 19.1 41.6 9.5 0.0 --	-- -- -- -- -- New Course -- -- -- -- -- -- --
--	---	---	---	---	---	--	--	--

NOOKSACK RIVER

Panorama	21A5	4300	2/1	196	77.6	39.8	45.6	--
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OLYMPIC PENINSULADUNGENESS RIVER

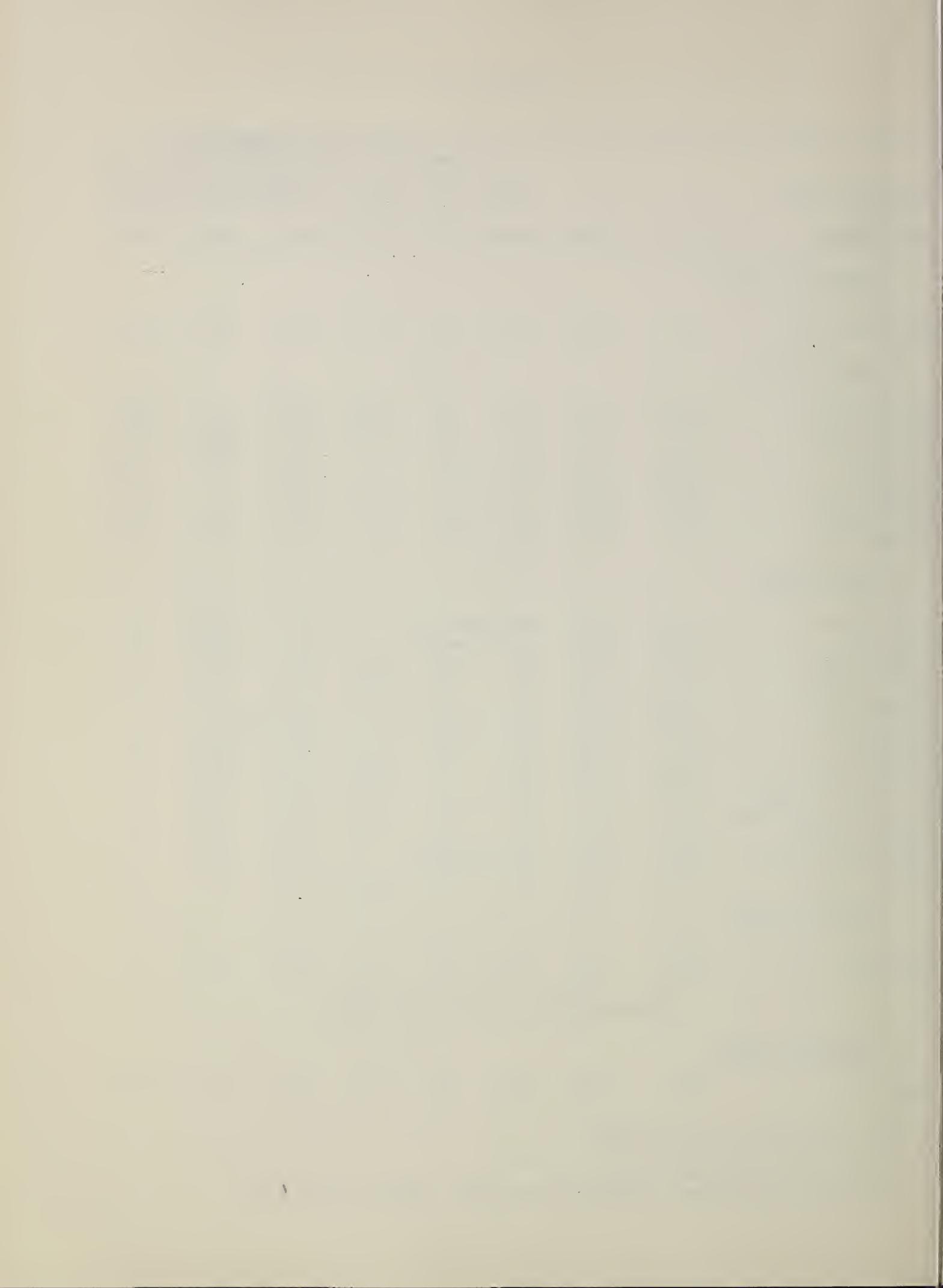
Deer Park	23B4	5200	1/28	61	14.7	9.6	12.9	19.2*
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Not directly on this drainage.

* Adjusted 1943-57 average.

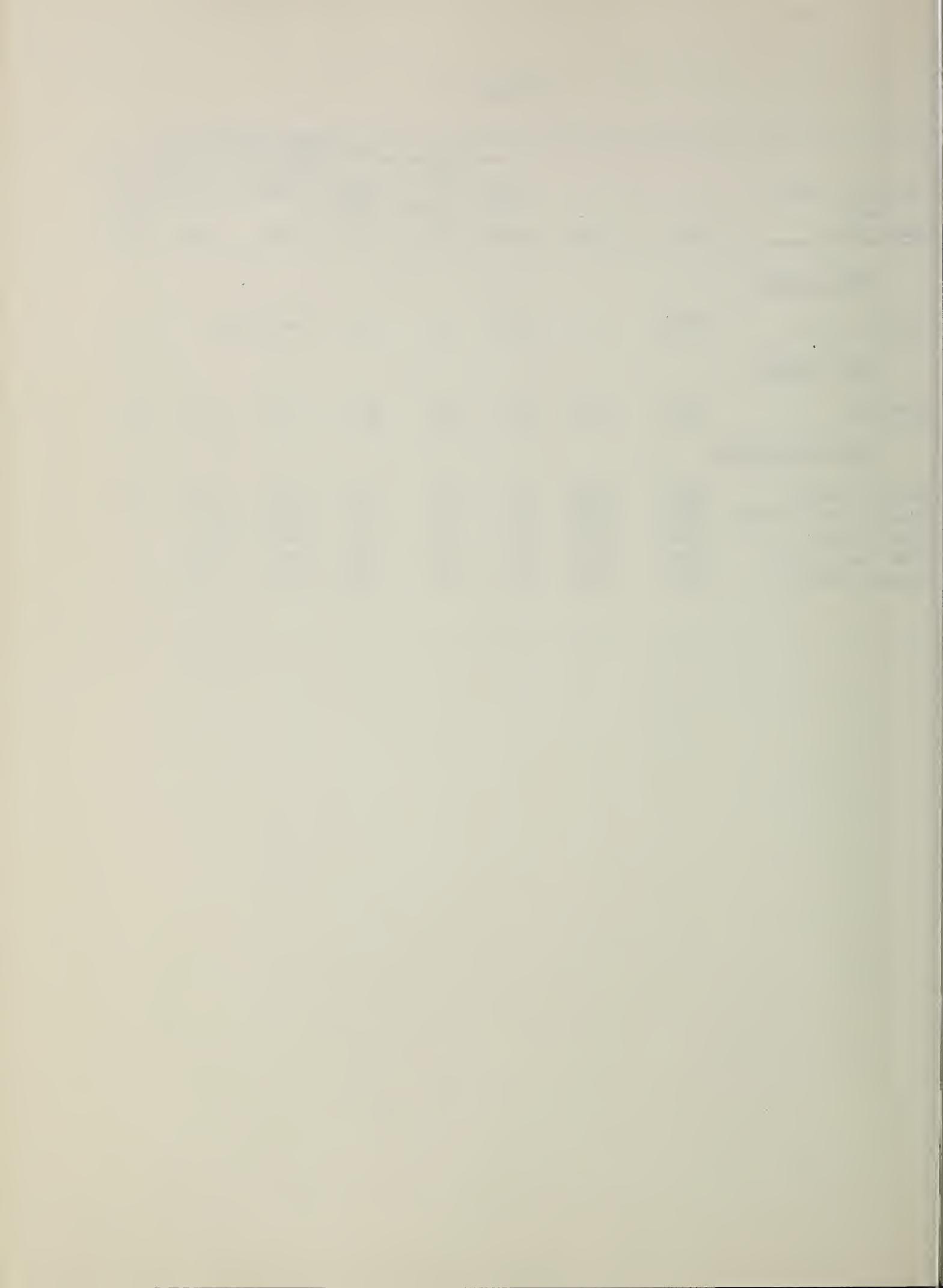
** Average for period of record.

+ Snow water equivalent estimated from aerial stadia observation.



APPENDIX 15

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENTS					
			1964		:Past Record			
			Date of Survey	Snow Depth (In.)	Water Content (In.)	Water Content: 1943-57	1963	1962
<u>MORSE CREEK</u>								
14 Mile Post	21B11		1/29	12	2.1	New Course		
<u>ELWHA RIVER</u>								
Hurricane	23B3	4500	2/3	89	26.4	8.0	13.8	--
<u>SKOKOMISH RIVER</u>								
Black & White	23B7	4200	2/1	134	41.8	11.0	18.5	--
Black & White Lakes	23B6	4700	2/1	145	52.0	25.5	34.8	--
Four Stream	23B10	3000	2/2	71	25.0	New Course		
Home Sweet Home	23B5	5200	2/1	219	75.0	35.7	47.0	--
Sundown Pass	23B8	3900	2/1	162	50.5	14.4	28.3	--



Agencies Assisting with Snow Surveys

GOVERNMENT AGENCIES

Canada:

Department of Lands, Forests and Water Resources,
Water Resources Service, British Columbia

States:

Washington State Department of Conservation
Washington State Department of Natural Resources

Federal:

Department of the Army
Corps of Engineers
U. S. Department of Agriculture
Forest Service
U. S. Department of Commerce
Weather Bureau
U. S. Department of the Interior
Bonneville Power Administration
Bureau of Reclamation
Geological Survey
National Park Service

PUBLIC AND PRIVATE UTILITIES

Chelan County P.U.D.
Pacific Power and Light Company
Puget Sound Power and Light Company
Washington Water Power Company

OTHER PUBLIC AGENCIES

Okanogan Irrigation District

MUNICIPALITIES

City of Walla Walla
City of Tacoma
City of Seattle

Other organizations and individuals furnish valuable information for snow survey reports. Their cooperation is gratefully acknowledged.

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